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8568A
SPECTRUM ANALYZER
100 Hz to 1.5 GHz

volume 3

SECTION IX

IF - Display Section

Service

SAFETY

This instrument has been designed and tested according to International Safety Requirements. To ensure safe operation and to keep the instrument safe, the information, cautions, and warnings in this manual must be heeded. Refer to Section I for general safety considerations applicable to this instrument.

CERTIFICATION

Hewlett-Packard Company certifies that this instrument met its published specifications at the time of shipment from the factory. Hewlett-Packard Company further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY AND ASSISTANCE

This Hewlett-Packard product is warranted against defects in materials and workmanship for a period of one year from the date of shipment. Hewlett-Packard will, at its option, repair or replace products which prove to be defective during the warranty period provided they are returned to Hewlett-Packard. Repairs necessitated by misuse of the product are not covered by this warranty. NO OTHER WARRANTIES ARE EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. HEWLETT-PACKARD IS NOT LIABLE FOR CONSEQUENTIAL DAMAGES.

Service contracts or customer assistance agreements are available for Hewlett-Packard products that require maintenance and repair on-site.

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volume 3

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SECTION IX
IF-DISPLAY SECTION
SERVICE

9-1. INTRODUCTION

9-2. This volume of the Operating and Service Manual contains information for troubleshooting and repair of the IF-Display Section of the instrument. This information is combined in package form as service sheets and indexed with tabs for quick reference. Also included, separate from the service sheets, are repair procedures for removal and replacement of assemblies to be repaired and/or replaced.

9-3. SERVICE SHEETS

9-4. The service sheets in this manual are organized in signal-flow order and are indexed with tabs to make it easy to locate a specific service sheet. Each of the service sheets contains the following information:

Circuit Description (where practical)
Troubleshooting Hints (where practical)
Replaceable Parts List
Component Location Illustration
Block Diagram (where practical)
Schematic Diagram

Also included, where applicable, are Signature Analysis Troubleshooting Diagrams for troubleshooting of digital circuits using signature analysis.

9-5. REPAIR PROCEDURES

9-6. Repair procedures are included in this volume of the manual for use in removing and replacing assemblies for repair. These procedures are located near the front of this volume and are referenced in the CONTENTS in this volume. These procedures include such items as CRT Replacement, front-panel LED replacement, and internal fuse replacement.

9-7. MAJOR ASSEMBLY AND COMPONENT LOCATIONS

9-8. Major assembly and component location illustrations for the IF-Display Section are contained in this volume (Figure 9-10) and near the end of Volume 1.

9-9. TROUBLESHOOTING

9-10. Troubleshooting information for the IF-Display Section is contained in the individual service sheets in this volume. This information consists of voltages and waveforms on schematic diagrams, notes and tables on schematic diagrams, troubleshooting hints located immediately following the circuit description, and signature analysis troubleshooting diagrams where applicable.

9-11. SIGNATURE ANALYSIS USING THE HP MODEL 5004A SIGNATURE ANALYZER

9-12. General Description

9-13. This instrument has been designed to incorporate signature analysis. Troubleshooting the instrument using signature analysis requires the use of the HP Model 5004A Signature Analyzer. The HP Model 5004A Signature Analyzer is a service tool. It receives signals from the circuit under test, compresses them, and displays the result in the form of digital signatures associated with data nodes in the circuit under test.

9-14. Features (Refer to HP 5004A Signature Analyzer Operating and Service Manual.)

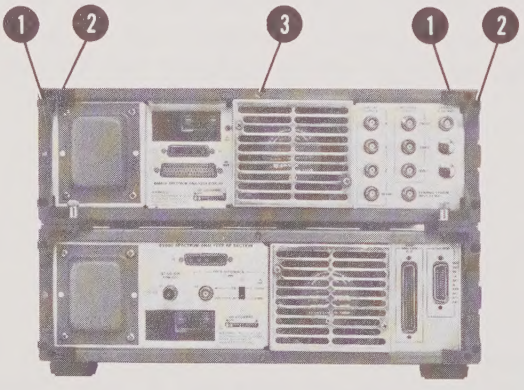
9-15. Front Panel. On the front panel are four large seven-segment displays. A light to the left of the display indicates gate (measurement window) activity and another light on the right indicates the presence of an unstable signature. Six

IF-DISPLAY SECTION INTERNAL FUSE REPLACEMENT

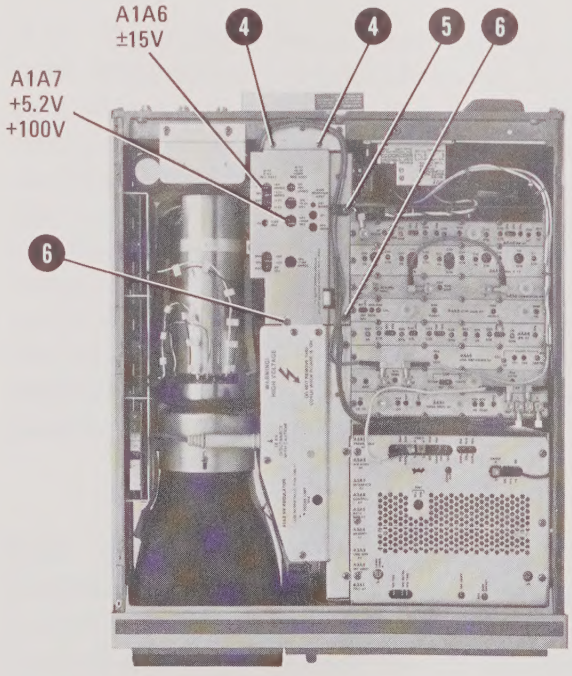
WARNING

Remove AC Line cord from both instruments before proceeding with this procedure.

1. Remove feet (1) from rear of instrument by removing screws (2) shown in View A.
2. Remove top cover from IF-Display Section by loosening screw (3) shown in View A.
3. Remove metal cover from Low Voltage Power Supply section by removing rear screws (4), cable clamp and screw (5), and front screws (6) shown in View B.
4. The fuses for the +15 Vdc and −15 Vdc supplies are located on the A1A6 ±15V Regulator and the fuses for the +5.2 Vdc and +100 Vdc supplies are located on the A1A7 +5.2V, +100V Regulator. Locations are shown in View B.
5. Part number information is located in Volume 1, Section VI and location of fuses on printed circuit boards can be found in Figures 9-125 and 9-126.



VIEW A



VIEW B

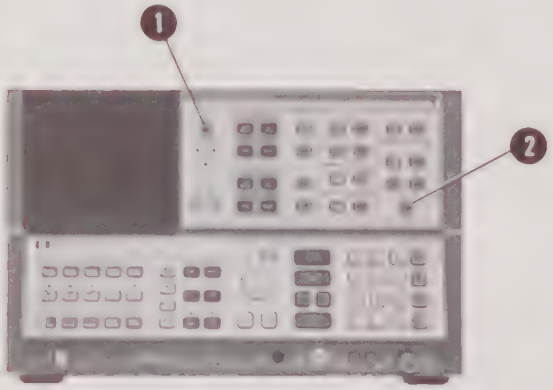
Figure 9-1. IF-Display Section Internal Fuse Replacement

FRONT-PANEL LED REPLACEMENT

1. Set instrument LINE switch to STANDBY.

2. Loosen set screws in INTENSITY control and Video Trigger LEVEL control knobs ❶ and ❷ using a No. 2 allan wrench (HP Part Number 8710-0892) and remove knobs.

FRONT PANEL VIEW



3. Remove nut from INTENSITY control and from Video Trigger LEVEL control using a 5/16-inch wrench.

4. Front panel is now loose. It may be necessary to pry front panel out slightly using a sharp instrument such as a knife blade along the edge of the panel.

5. Front-panel LEDs are now accessible for replacement. To replace LED, pull out defective LED with fingers (it may be necessary to pry slightly with a pointed instrument such as a soldering aid) and insert new LED in socket.

Figure 9-4. Front-Panel LED Replacement (1 of 2)

FRONT-PANEL LED REPLACEMENT (Cont'd)

6. The RECORDER pushbutton LEDs (3), LOWER LEFT and UPPER RIGHT cannot be replaced as described in Step 5. To replace these LEDs, it is necessary to remove the pushbutton keys and the A1A1 Keyboard:

   a. Remove key housing the defective LED by prying the key outward using a pointed instrument such as a soldering aid.

   b. Remove sub-panel and A1A1 Keyboard by removing the screws (4) from the perimeter and prying forward if necessary with a pointed instrument.

   c. Unsolder the defective LED from the rear of the A1A1 Keyboard.

   d. Loosen the leads from the printed circuit board using a soldering aid and push on the leads to force LED out of switch through the front of the panel.

   e. Insert new LED through the switch from the front of the panel so that leads extend through the printed circuit board at the rear of the Keyboard.

   f. Pull leads of LED with fingers or needle-nose pliers to ensure that LED is far enough inside of the switch to allow the key to be reinstalled.

   g. Solder LED leads to printed circuit board and reassemble front panel.

SUB PANEL VIEW

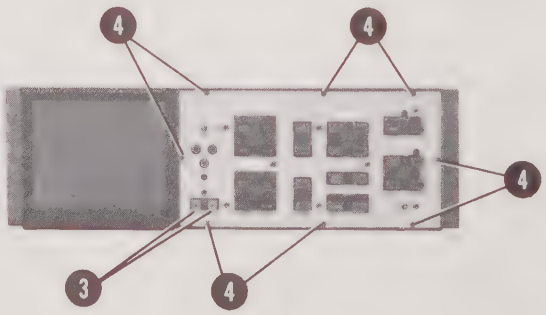


Figure 9-4. Front-Panel LED Replacement (2 of 2)

GRAPHIC SYMBOLS USED ON SCHEMATIC AND BLOCK DIAGRAMS

BASIC COMPONENT SYMBOLS

Variable Resistor: CW indicates clockwise rotation of shaft moves wiper towards location of CW.

Thermistor

Electrolytic Capacitor

Feedthrough Capacitor

Toroidal Transformer

Relay

Slide, Toggle, or Rocker Switch

Ferrite Bead

Pushbutton Switch

General Purpose Diode

Breakdown Diode: Zener

Schottky Diode

Varactor Diode (Varicap)

Light-Emitting Diode

PIN Diode

Temperature-Compensated Voltage-Reference Diode

SCR (Semiconductor Controlled Rectifier)

MOS-FET, N-Channel

MOS-FET, P-Channel

Figure 9-6. Graphic Symbols (1 of 2)

GRAPHIC SYMBOLS USED ON SCHEMATIC AND BLOCK DIAGRAMS

BASIC COMPONENT SYMBOLS (Cont'd)

Indicates a factory selected component

Indicates shielding conductor for cables

Indicates a plug-in connection

Indicates a soldered or mechanical connection

Indicates a single pin of a PC board edge connector

Connection symbol indicating a Jack

Connection symbol indicating a Plug

Test Point: Terminal provided for test probe connection

Measurement Point: Used to indicate a convenient point for measurement. No terminal provided for test probe.

Indicates wire or cable color code. Color code same as resistor color code. First number indicates base color, second and third numbers indicate colored stripes.

Jumper wire

Earth ground symbol

Instrument chassis ground. May be accompanied by a number or letter to specify a particular ground.

Screwdriver adjustment

Panel control

COMMONLY USED ASSEMBLY AND CIRCUIT SYMBOLS

Oscillator, RPG (Rotary Pulse Generator)

Mixer

Fan, Motor

Transmission Line

Figure 9-6. Graphic Symbols (2 of 2)

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS

The following is a guide to the symbols used for digital or logic ICs in this manual. The symbology is based upon American National Standard ANSI Y32.14, *Graphic Symbols for Logic Diagrams (Two-State Devices)*, but does not strictly follow the standard. This figure should be consulted for the explanation of digital IC symbols used in Sections VIII and IX.

DEFINITIONS

Logic Element: The part or parts of a logic device symbol having a well-defined logic function (OR, AND, FLIP-FLOP, etc.) and one or more outputs. The inputs of a logic element may be data or control inputs; the outputs are data outputs.

Control Block: The part of a logic device symbol to which all logic lines common to a group of logic elements are connected. Lines connected to a control block are control lines.

Function Label: The notation within a logic device symbol that denotes its overall logic function (counter, shift register, multiplexer, etc.).

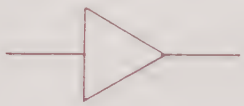
Line Label: The symbol or abbreviation associated with an output or input line that defines the action of the line.

Indicator Symbol: A symbol associated with an input or output line which defines the active state or special characteristics of the line.

BASIC LOGIC SYMBOLS

Distinctive-Shape Symbols

Amplifier/Buffer



AND Gate

Figure 9-7. Schematic Symbols for Digital Integrated Circuits (1 of 8)

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

OR Gate

EXCLUSIVE OR Gate

Schmitt Trigger

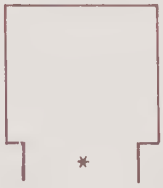
Rectangular Symbols

General Logic Element

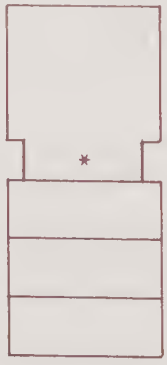
NOTE

The asterisk indicates where the function label is placed

Control Block



Logic Elements with Common Control Block



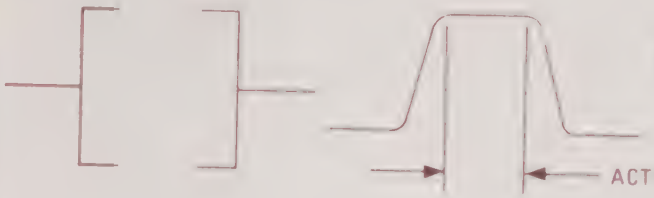
NOTE

If elements sharing control lines are widely separated, each element will have a control block.

Figure 9-7. Schematic Symbols for Digital Integrated Circuits (2 of 8)

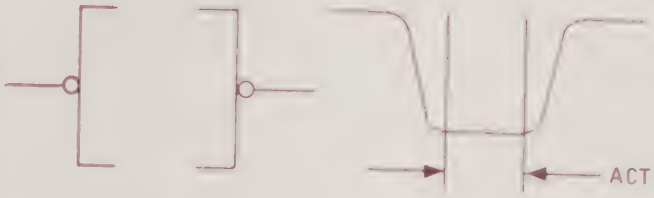
SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

INDICATOR SYMBOLS (positive logic assumed)



ACTIVE-HIGH inputs and outputs are indicated by the absence of the negation symbol, ○.

ACTIVE PERIOD

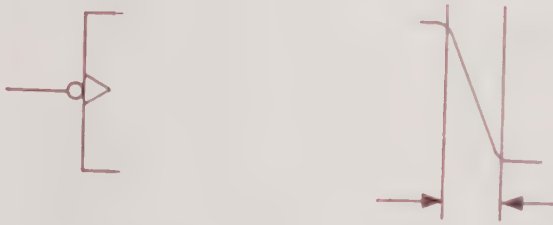


ACTIVE-LOW inputs and outputs are indicated by the presence of the negation symbol, ○.

ACTIVE PERIOD

EDGE-SENSITIVE (Dynamic) inputs are indicated by the presence of the dynamic input symbol,

ACTIVE PERIOD



ACTIVE PERIOD

TRAILING-EDGE ACTIVATED outputs are indicated by the output delay symbol, ⌝. These outputs become active when the signal that initiates the change returns to its original state (example: the outputs of a J-K master-slave flip-flop).

OPEN-COLLECTOR outputs are indicated by the presence of the open-collector symbol, ◊.

Figure 9-7. Schematic Symbols for Digital Integrated Circuits (3 of 8)

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

NOTE

The logic negation symbol (○) alone gives no information about the actual voltage levels used in a digital circuit. For this reason the type of logic system (positive or negative) must be specified. In this manual, unless otherwise noted on the schematic, the logic system is positive; that is, the more positive voltage level is the HIGH or 1-state and the less positive level is the LOW or 0-state.

FUNCTION LABELS

Σ	ADDER
▷	AMPLIFIER BUFFER
1 ⎍⎍	MONOSTABLE MULTIVIBRATOR (ONE-SHOT)
&	AND GATE
≥1	OR GATE
=1	EXCLUSIVE OR GATE
X→Y	ENCODER, DECODER
XMAX→Y	PRIORITY ENCODER
⎍	SCHMITT TRIGGER
ALU	ARITHMETIC AND LOGIC UNIT
CTR	COUNTER
DEMUX	DEMULTIPLEXER
FF	FLIP-FLOP
MUX	MULTIPLEXER
RAM	RANDOM-ACCESS MEMORY
REG	REGISTER
ROM	READ-ONLY MEMORY
SAR	SUCCESSIVE APPROXIMATION REGISTER
SR	SHIFT REGISTER

Figure 9-7. Schematic Symbols for Digital Integrated Circuits (4 of 8)

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

LINE LABELS

←	SHIFT LEFT (OR UP)
→	SHIFT RIGHT (OR DOWN)
+1	COUNT UP
−1	COUNT DOWN
−0, −1	BORROW OUTPUT
+9, +1	CARRY OUTPUT (DECIMAL COUNTER)
+15, +1	CARRY OUTPUT (BINARY COUNTER)
Xn	CLOCK INPUT
C	CLOCK INPUT
D	DATA OR DELAY INPUT (FLIP-FLOP)
Dn	nth DATA BIT INPUT
EN	ENABLE
E	3-STATE ENABLE INPUT (SEE "DEPENDENCY")
G	GATING INPUT (SEE "DEPENDENCY")
J	J-K FLIP-FLOP J INPUT
K	J-K FLIP-FLOP K INPUT
LD	LOAD ENABLE INPUT (SYNCHRONOUS)
PS	PRESET INPUT (ASYNCHRONOUS)
R	RESET OR CLEAR INPUT
RD	READ ENABLE INPUT (RAM, ROM)
S	SET INPUT
SEL	LINE OR FUNCTION SELECT INPUT
SER	SERIAL DATA INPUT (SHIFT REGISTER)
T	TRIGGER INPUT (MONOSTABLE)
WR	WRITE ENABLE INPUT (RAM)
Yn	nth DATA BIT OUTPUT OR I/O
3-ST (placed by function label)	3-STATE

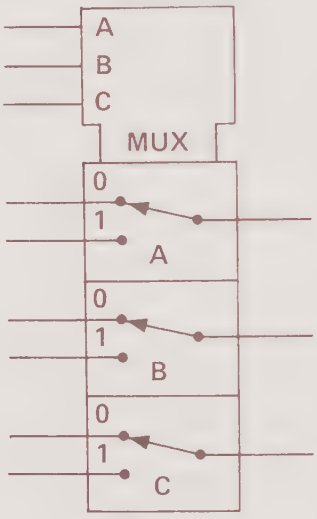
Figure 9-7. Schematic Symbols for Digital Integrated Circuits (5 of 8)

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

NOTES

1. The suffix or subscript 0 denotes the least significant bit (LSB) of a data or address word.

2. Letters may be used to identify a line or logic element without indicating a specific logic function. For example:

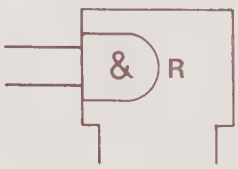


Triple 2-Channel Multiplexer

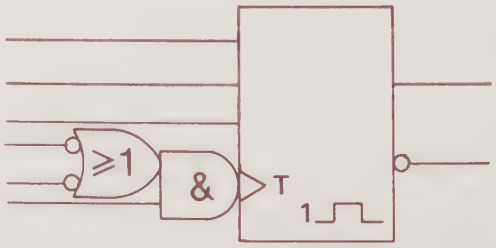
Letters are used to relate control inputs to logic elements. The numerals 0 and 1 indicate 0-state and 1-state, respectively, and relate the position of a "switch" to the logic state of the corresponding control line.

DEPENDENCY (G and F)

The gating of inputs or outputs by an input is indicated with gate symbols or the G line label.



two inputs ANDed to produce a reset



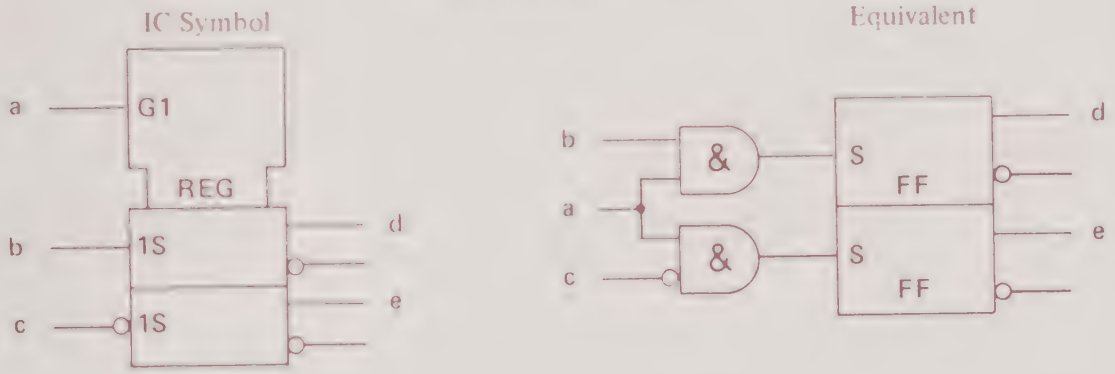
three inputs gated to produce a trigger

Figure 9-7. Schematic Symbols for Digital Integrated Circuits (6 of 8)

SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

When the G label is used, the gating input is labelled with a G followed by a numeral or letter. The line labels of the gated inputs or outputs are prefixed with the same numeral or letter. Two examples are:

2-Bit Register



2-to-4-Line Decoder

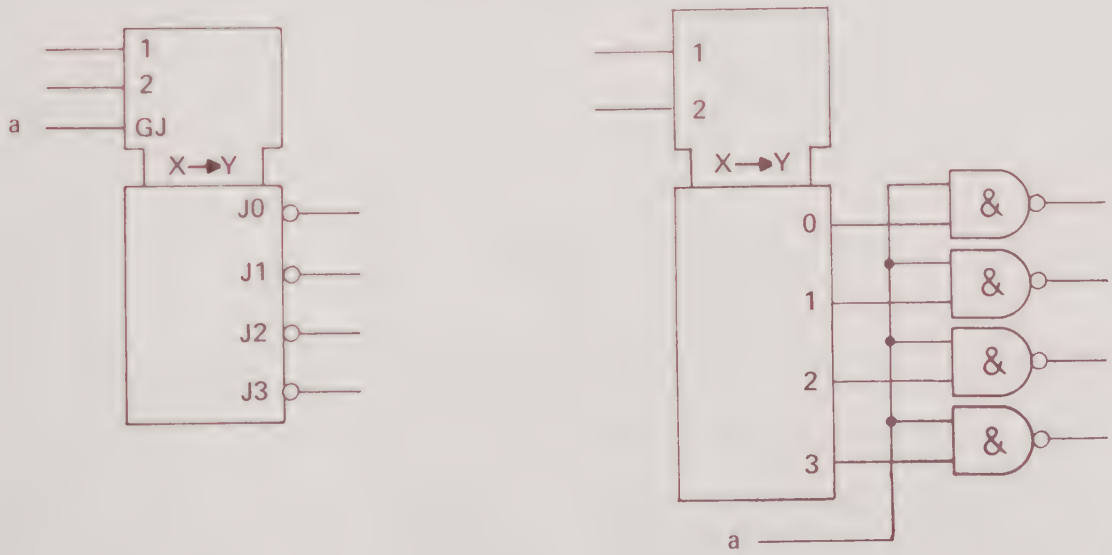
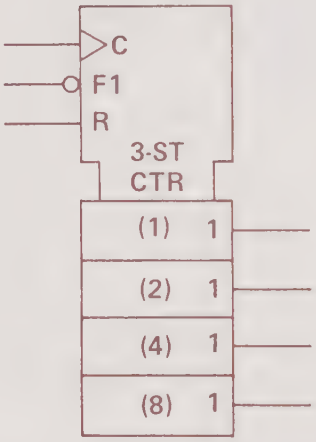


Figure 9-7. Schematic Symbols for Digital Integrated Circuits (7 of 8)

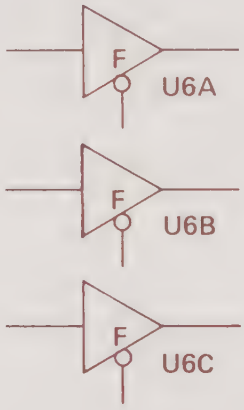
SCHEMATIC SYMBOLS FOR DIGITAL INTEGRATED CIRCUITS (Cont'd)

The F line label is used to indicate 3-state logic. The 3-state enable input is labelled with an F and numerals or letters are used as with the G label:

Counter with
3-State Outputs



3-State Buffers



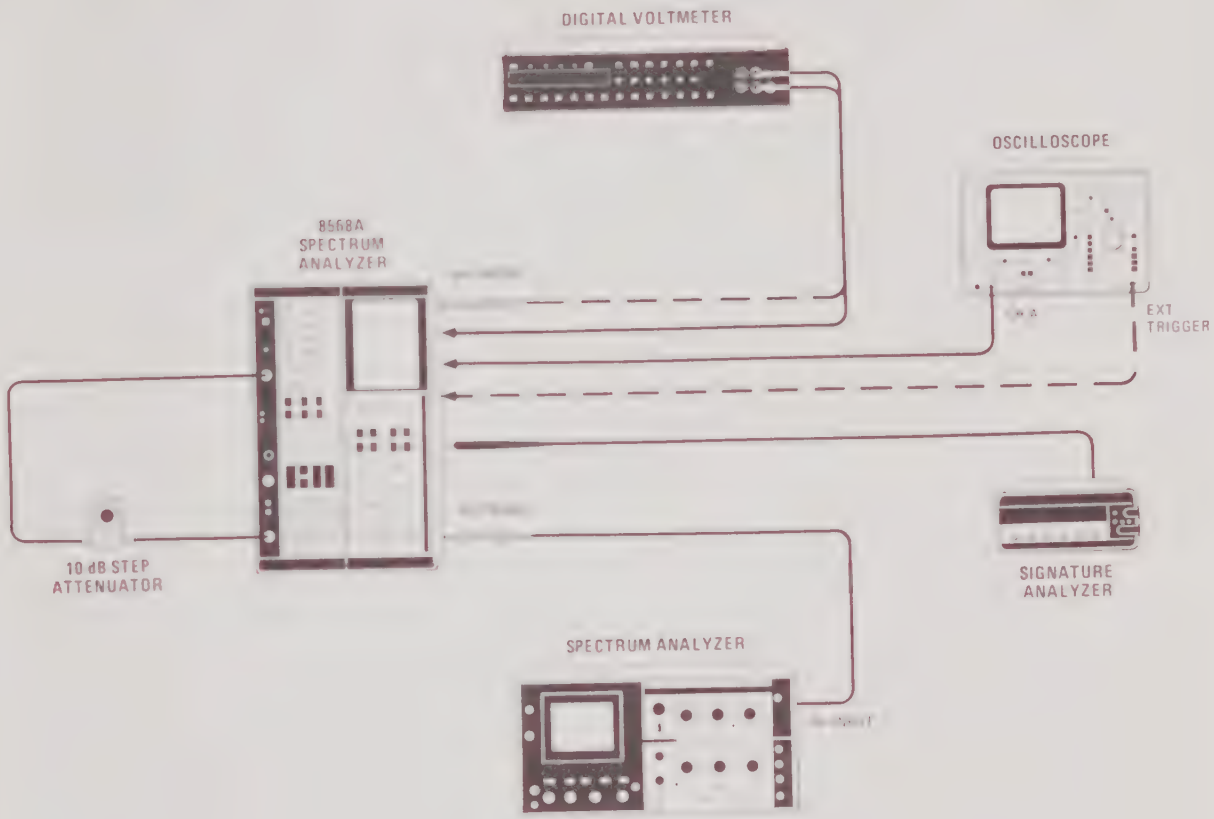
WEIGHTING OF INPUT AND OUTPUT LINES

The coding of multiplexers, demultiplexers, encoders, and decoders is shown by decimal weighting. An example is the 2-to-4-line decoder shown above.

WEIGHTING OF FLIP-FLOPS

When the position of a flip-flop in an array is significant (as in counters and shift registers), the flip-flop is labelled with its decimal weight. An example is the "Counter with 3-State Outputs" shown above.

Figure 9-7. Schematic Symbols for Digital Integrated Circuits (8 of 8)



EQUIPMENT:

Spectrum Analyzer	HP 8553B/8552B/141T
AC Probe	HP 1121A
Oscilloscope	HP 1741A
Digital Voltmeter	HP 3455A
High Voltage Probe	HP 34111A
Signature Analyzer	HP 5004A
Step Attenuator	HP 355D
50Ω Termination	HP 11593A

Figure 9-9. Equipment Setup for Troubleshooting

MNEMONICS FOR IF DISPLAY SECTION

Mnemonic	Description
[illegible]	Instrument Bus Data Bits Ø through 15
[illegible]	Instrument Bus Address Bits Ø through 3
[illegible]	Digital Storage Bus Data Bits Ø through 11
[illegible]	Fast Sweep Output
[illegible]	HIGH=Sweeping
PENLIFT	Recorder PENLIFT control
ICLK	Indicator Clock (Front-Panel LEDS)
LUSEN	LOW=Last Sweep Enable
LRTRC	LOW=Retrace Signal
FSZ	Fast Sweep Z Axis
AUX BLANK	Auxiliary Blanking Output
BLANK	LOW=Blanking Control
HLDX	Hold X Position (Sample and Hold Control)
HLDY	Hold Y Position (Sample and Hold Control)
SMPL	Sample
AUX Z	Auxiliary Z Axis Output
X	Horizontal Signal to CRT
Y	Vertical Signal to CRT
Z	Intensity Signal to CRT
INTG	Integrator Control
INTG	LOW=Integrator Control
LL	Long Line
LL	LOW=Long Line
LGX	Line Generator Horizontal Signal
LGY	Line Generator Vertical Signal
ΔX	Delta X Position
ΔY	Delta Y Position
STROKE	Stroke 8 of Current Character
MAØ MA11	Memory Address Bus Bits Ø through 11
POS	Sign of ALU Results
LZERO	Output of Zero Check on ALU Result
RØ R11	Ram Bus Bits Ø through 11
AØ A11	Accumulator Bus Bits Ø through 11
FØ F11	Function Bus Bits Ø through 11
SØ S11	Source Bus Bits Ø through 11
RMØ RM2	Ram Register Select Bits Ø through 2
LDMEN	Data Manipulator Output Enable
FCØ FC3	Data Manipulator Function Control Bits Ø through 3
QSØ QS3	Qualifier Selection Bits Ø through 3
PSØ PS3	I/O Port Selection Bits Ø through 3
IOC	I/O Port Input/Output Control
LWRITE	Memory Write Control
LCLRSA	LOW=Clear Stroke Address
RSHS	Reset High Sweep
INCRSA	Increment Stroke Address
LRSTO	LOW=Reset Trigger Occurred
RSEN	Reset Peak Detectors Enable
CE	Memory Chip Enable
KSØ KS3	Constant Selection Bits Ø through 3
INTR	Interrupt
INSELA	Input Selection Bit A
INSELB	Input Selection Bit B
DOTEN	Dot Enable
HOLD	Track and Hold Control
BRIGHT	Bright CRT Display Control
LLGBLANK	LOW=Line Generator Blanking Control
DIM	Dim CRT Display Control
BLINK	Blink CRT Display Control
CHAR	Character Mode Display Control
LROMEN	LOW=ROM Enable
BS	Block Switch Control

Mnemonic	Description
[illegible]	Last Sweep Mode
[illegible]	Next State Bus Bits Ø through 7
[illegible]	Link State Bus Bits Ø through 7
[illegible]	State Bus Bits Ø through 7
[illegible]	Branch Length Bus Bits Ø through 6
[illegible]	5MHz System Clock
[illegible]	Inverted CLK
1MHZ	1MHz ADC Clock
LGCLK	200kHz Line Generator Clock
LION	LOW=Turn On
LDX	Load X Position Register
LDCHAR	Load Character Register
LDMDR	Load Memory Data Register
LDY	Load Y Position Register
LDMAR	Load Memory Address Register
LDRMP	Load Ramp Register
LTSTA	LOW=Input Test A Data
LTSTB	LOW=Input Test B Data
LMEMEN	LOW=Enable Memory Output
LADC	LOW=Enable ADC Output
LRTN	LOW=Enable Interrupt Return
LDEXP	Load Expand Register
LQ	LOW=Selected Qualifier
LDSR	LOW=Digital Storage Ready
LIIO	LOW=Top Box I/O Strobe
SG10 SG20-1 SG20-2	Step Gain Controls
OS10 OS20-1 OS20-2	Offset Gain Controls
LG10 LG20	Linear Gain Controls
VBWA VBWB VBWC VBWD	Video Bandwidth Controls
RBWA RBWB RBWC RBWD	Resolution Bandwidth Controls
VIDEO	Video Signal
SWITCH	Up/Down Converter Control
18.4MHz LO	18.4MHz Local Oscillator Signal
21.4MHz	21.4MHz IF Signal
3MHz	3MHz IF Signal
BW5 BW7 BW63 BW68	Bandwidth Controls
FRIQ ZERO	Frequency Zero Control
CRT DSBL	CRT Disable Control
REC CAL	Recorder Calibrate
REC ZERO	Recorder Zero
A LOG B LOG	Log Expand Controls
LOG/LIN	Log/Linear Control
A2dB A4dB A8dB A10dB A20dB AVdB	Attenuation Controls

50-WIRE INSTRUMENT BUS PIN CONNECTION TABLE FOR IF DISPLAY SECTION

Pin	Signal	Description
1	GND	Ground
2	NC	No Connection
3	IOB0	Instrument Bus Data Bits Ø 15
4	IOB1	
5	IOB2	
6	IOB3	
7	IOB4	
8	IOB5	
9	IOB6	
10	IOB7	
11	IOB8	
12	IOB9	
13	IOB10	
14	IOB11	
15	IOB12	
16	IOB13	
17	IOB14	
18	IOB15	
19	NC	No Connection
20	NC	No Connection
21	NC	No Connection
22	HPON	HIGH=H-Display Section Power ON
23	ADR0	Instrument Bus Address Bits Ø 4
24	ADR1	
25	ADR2	
26	ADR3	
27	ADR4	
28	ADR5	Address Bit 5 not used
29	NC	No Connection
30	NC	No Connection
31	KR8	Key Rows 8 11
32	KR9	
33	KR10	
34	KR11	
35	KC0	Key Columns Ø 7
36	KC1	
37	KC2	
38	KC3	
39	KC4	
40	KC5	
41	KC6	
42	KC7	
43	LSTP	LOW=Stop Processor
44	HSWP	HIGH=Sweeping
45	LSRQ	LOW=Service Request
46	LDSR	LOW=Digital Storage Ready
47	LBIO	LOW=Bottom Box I/O Strobe
48	GND	Ground
49	LTIO	LOW=Top Box I/O Strobe
50	GND	Ground

A4A8 ATTENUATOR—BANDWIDTH FILTER, CIRCUIT DESCRIPTION (Service Sheet 3)

A4A8 Attenuator Bandwidth Filter and A4A4 Bandwidth Filter operate at 21.4 MHz and are variable in bandwidth from 3 kHz to 3 MHz. The narrower bandwidths (3 kHz through 30 kHz) are obtained from five synchronously tuned crystal filters; the wider bandwidths (100 kHz through 3 MHz), from four synchronously tuned LC tank circuits. (The bandwidths 10 Hz through 1 kHz are obtained from A4A7 3 MHz Filter.) The Bandwidth Filter assemblies are on similar printed-circuit boards. A4A8 has two LC filters and two crystal filters, and A4A4 has two LC filters and three crystal filters. (A4A6A1 Up Converter has a single 21.4 MHz crystal that is used only for bandwidths ≤ 1 kHz.) These six crystals comprise a matched set and must be replaced as such. The replacement assemblies are shipped without crystals, so the crystals from the replaced boards must be used again.

10 — 20 dB Attenuator, 10 dB Amplifier (A)

The 10 dB Amplifier is a common emitter amplifier with a gain of ≈ 10 dB.

$$G = \frac{R63}{R3 \| R62} \qquad G_{dB} = 20 \log G$$

$$\approx \frac{287}{90.91} \qquad = 20 \log 3.16$$

$$= 3.16 \qquad \cong 10$$

For the lower gain settings of 0 dB and −10 dB (activated by A10dB and A20dB respectively), additional collector resistance is switched in by CR3 or CR2, thereby lowering the gain.

Input buffer Amplifier (D)

The unity gain Input Buffer Amplifier functions as a non-inverting op amp (see Figure 9-13).

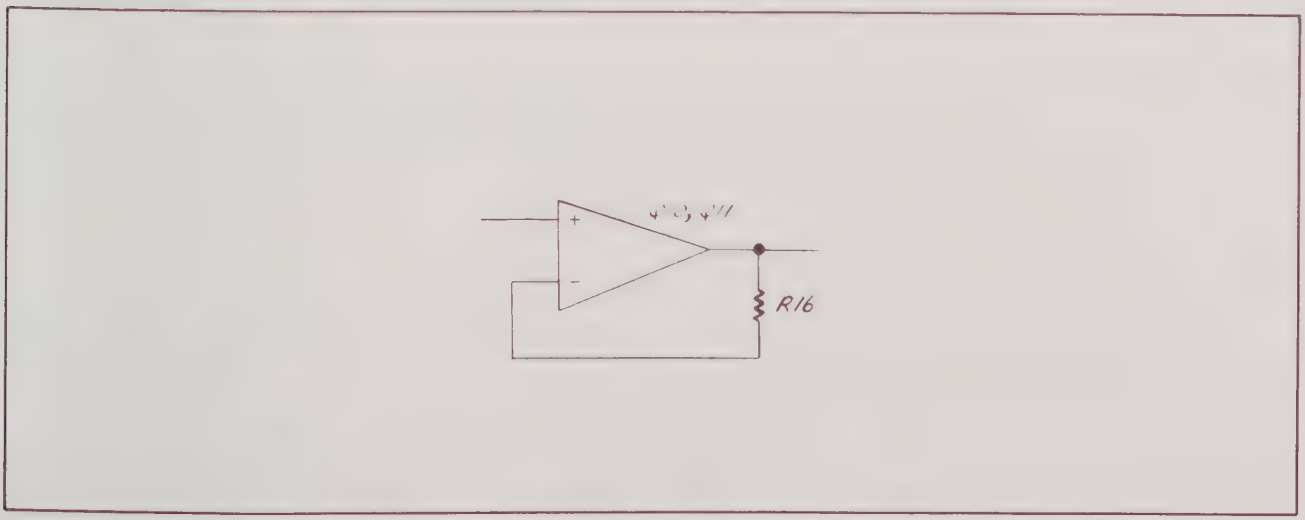


Figure 9-13. A4A8 Input Buffer Amplifier, Equivalent Circuit

In the crystal mode (3 kHz, 10 kHz, and 30 kHz bandwidths), the amplifier includes Q2. The biasing of the amplifier is independent of its ac (21.4 MHz) operation but is very critical for its proper functioning. If a malfunction occurs, the dc bias should be checked first.

The current through Q10 is determined by the difference between two current sources, one involving Q2 and the other involving Q11 (see Figure 9-14). The most convenient way to find the current from each source is to measure the voltage across each emitter resistor. (A 1 kΩ resistor should be used in series with the voltmeter probe tip to prevent the circuit from oscillating and giving an erroneous reading.) For Q2, the current through R60 must be included. If results are inconsistent, the emitter resistor should be checked also. Check to see that the BW5 line is at the voltage specified on the schematic.

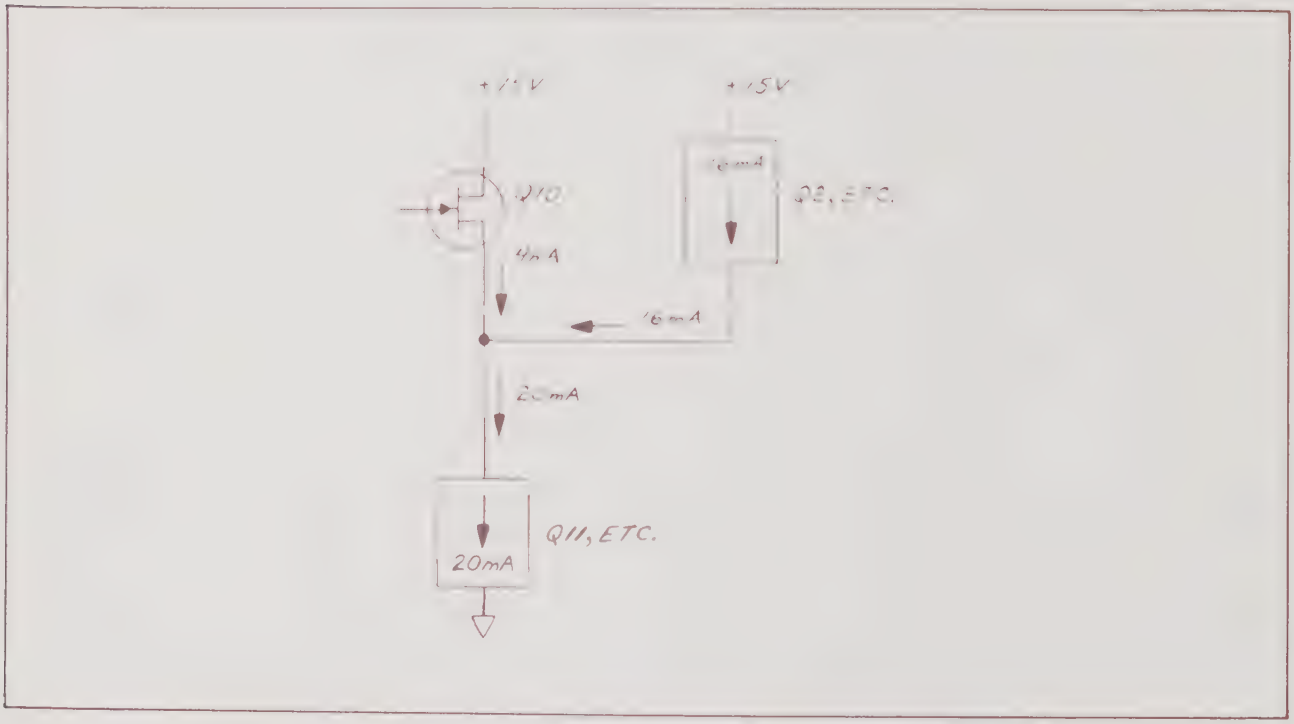


Figure 9-14. A4A8 Input Buffer Amplifier, Current Sinks

In the LC mode (the four wider bandwidths), the BW5 line goes to approximately +14.8V and turns off the current source Q2. The current supplied by Q2 in the crystal mode is now supplied through CR5 and R15 from the BW5 line. In the LC mode, the current thorugh Q10 can be found by subtracting the current through R5 from the current through R12.

Buffer Amplifier C

The Buffer Amplifier is similar to the Input Buffer Amplifier. The input is selected by the BW5 line from CR9 in the LC mode or from CR8 in the crystal mode.

In the crystal mode, the current through Q4 is determined by the difference between the current sourced by Q6 and that sunk by Q5 (about 4 mA). A significant deviation from this current should be reflected by the gate-to-source voltage of Q4. The source should be at least 0.4V more positive than the gate, but not more than 2.0V more positive. If the difference is less than 0.4V, the FET current is too high; if the difference is

greater than 2.0V, the FET current is too low. In either case the FET could also be defective. To determine precisely the current through Q4, the difference between the current through R47 and that through R61 should be subtracted from the current through R41. If the results are inconsistent, check the above-mentioned resistors.

In LC mode of operation, current is supplied through R44 and CR11 from the BW5 line instead of through Q6. The difference between the current through R44 and that through R41 yields the FET current.

Output Buffer Amplifier (I)

The Output Buffer Amplifier is a complementary pair of transistors in which Q8 acts as a source follower boosted by Q9. The current through FET Q8 is set by R58:

$$I_{FET} = \frac{V_{be}\ (Q9)}{196\Omega} \cong \frac{0.7V}{196\Omega} \cong 3\ mA$$

The total current through Q8 and Q9 is set by R59. The input is selected by the BW5 line from either CR15 in the LC mode or CR14 in the crystal mode.

Crystal Filtering Circuits (F) (I)

The bandwidths 3 kHz, 10 kHz, and 30 kHz are obtained by crystal filtering in the First Crystal Pole and Second Crystal Pole circuits. The crystals are used in series resonant mode and can be modeled as a series resonant circuit with a parallel capacitance (see Figure 9-15).

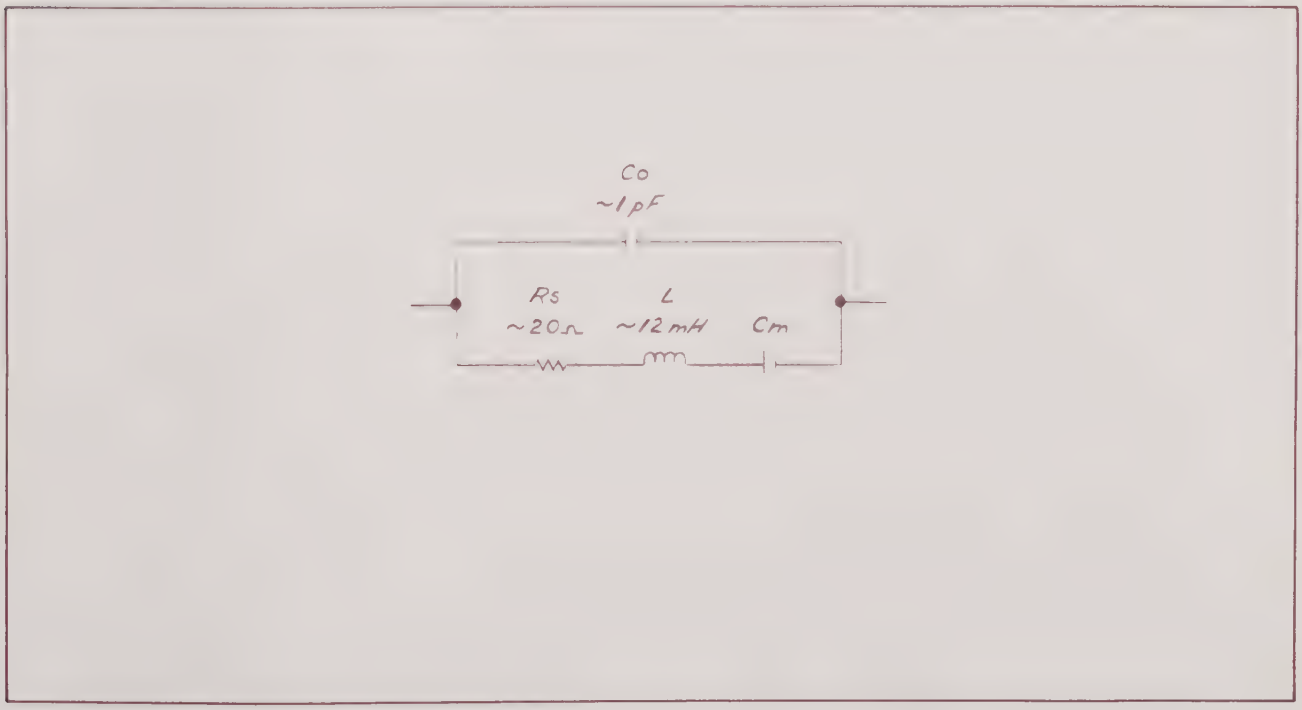


Figure 9-15. Quartz Crystal, Simplified Schematic

The parallel capacitance (C_O) and series resistance (R_S) are not desired and are compensated for in the circuit, as shown in the equivalent circuit of a single pole of crystal filtering (see Figure 9-16).

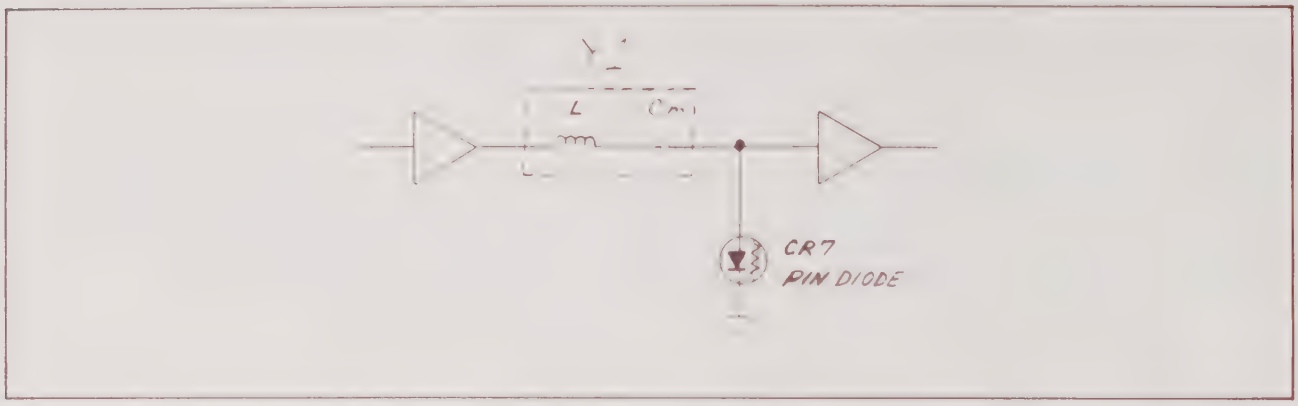


Figure 9-16. Crystal Filtering Pole, Equivalent Circuit

Since the two crystal filtering circuits are almost identical, the following description is for the First Crystal Pole circuit only.

The PIN diode CR7 functions as a variable resistor at 21.4 MHz. As the resistance is lowered by increasing the current in the BW63 line, the bandshape becomes narrower. The bandwidth of one pole widens to approximately 80 kHz when CR7 is turned off completely at the 30 kHz BW setting. (For a five-pole filter, the bandwidth of each pole is about 2.6 times the bandwidth of all five poles taken together. The bandwidth of two poles is about 1.5 times the bandwidth of all five poles taken together).

A simplified schematic of a crystal pole, including compensation for R_S and C_O in the crystal and input capacitance of the buffer amplifier, is shown in Figure 9-17.

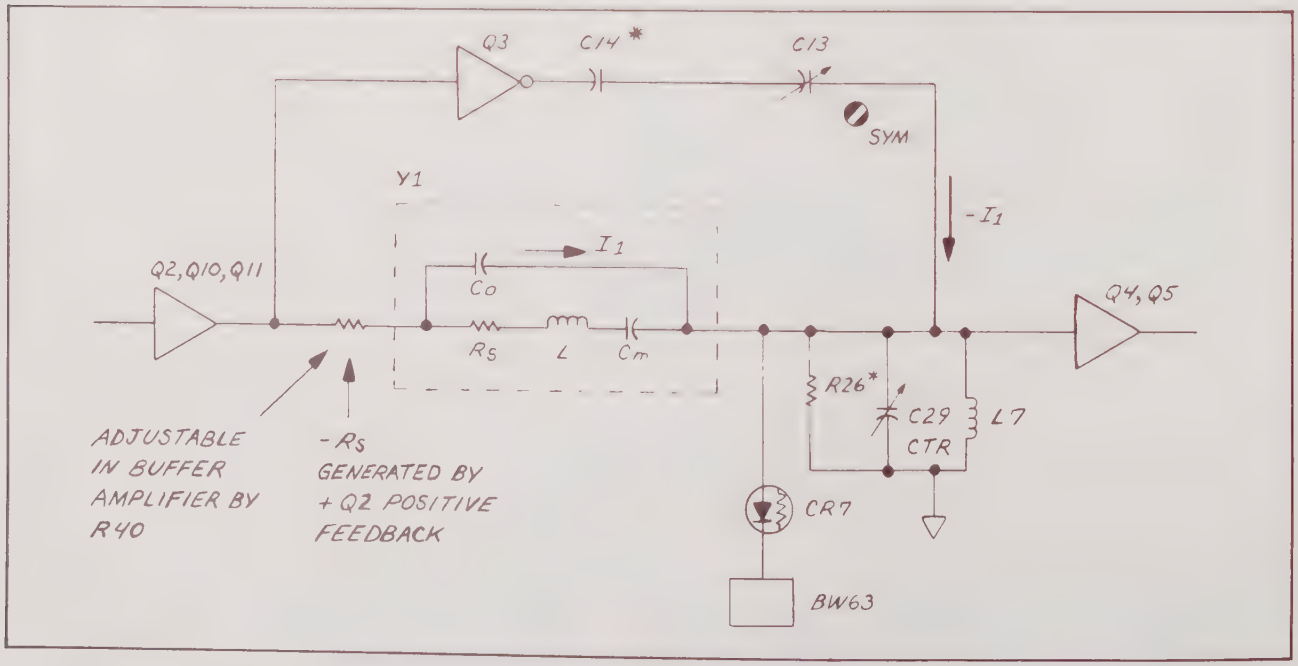


Figure 9-17, Crystal Pole, Simplified Schematic

The SYM adjustment C13 compensates for C_O by producing a current ($-I_1$) that is equal to the current (I_1) through C_O of the crystal but opposite in phase. These currents cancel, nullifying the effect of C_O. The positive feedback from the collector of Q2 generates a negative output resistance that cancels R_s of the crystal. This is approximated by resistor R16 in the Input Buffer Amplifier and XTL adjustment R40 in the Buffer Amplifier.

The input capacitance of the Buffer Amplifier, printed circuit board capacitance, PIN diode capacitance, and the centering (CTR) capacitor C29 are in parallel resonance with L8. These components have negligible effect on the band shape. As long as C29 has sufficient range to "dip" the band shape, they can be ignored in analyzing the remainder of the circuit.

The PIN diode CR7 controls bandwidths from 3 kHz to 10 kHz. For the 30 kHz bandwidth, CR7 is back biased, and R26 sets that bandwidth. If the 30 kHz bandwidth is much too narrow, even with CR7 back biased, the circuit might be loaded by a bad buffer amplifier (Q4, Q5). If the bandwidth is only slightly narrow it may be widened by padding R26*. If the narrowest bandwidth (3 kHz) has too little gain, and it cannot be increased enough by XTL adjustment R40, either the crystals have too high a series resistance (defective crystal), or the output resistance is not negative enough (defective Buffer Amplifier or Q3).

LC Filters (E) (H)

The two LC filtering circuits are used for the wider bandwidths (100 kHz through 3 MHz). They are similar in function; the Second LC Pole circuit is described. A schematic of the simplified equivalent circuit is shown in Figure 9-18.

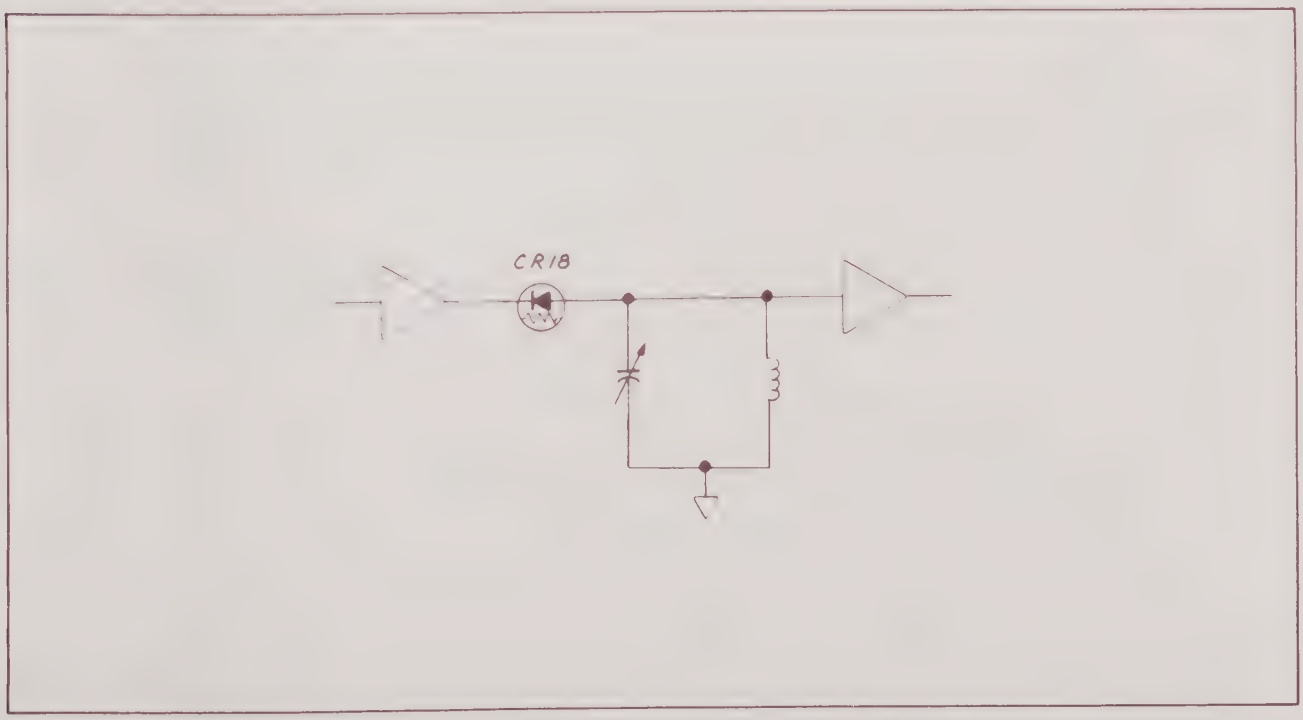


Figure 9-18. LC Pole, Equivalent Circuit

The Q (bandwidth) is set by the resistance of the PIN diode CR18. A more detailed schematic of the Second LC Pole circuit is shown in Figure 9-19.

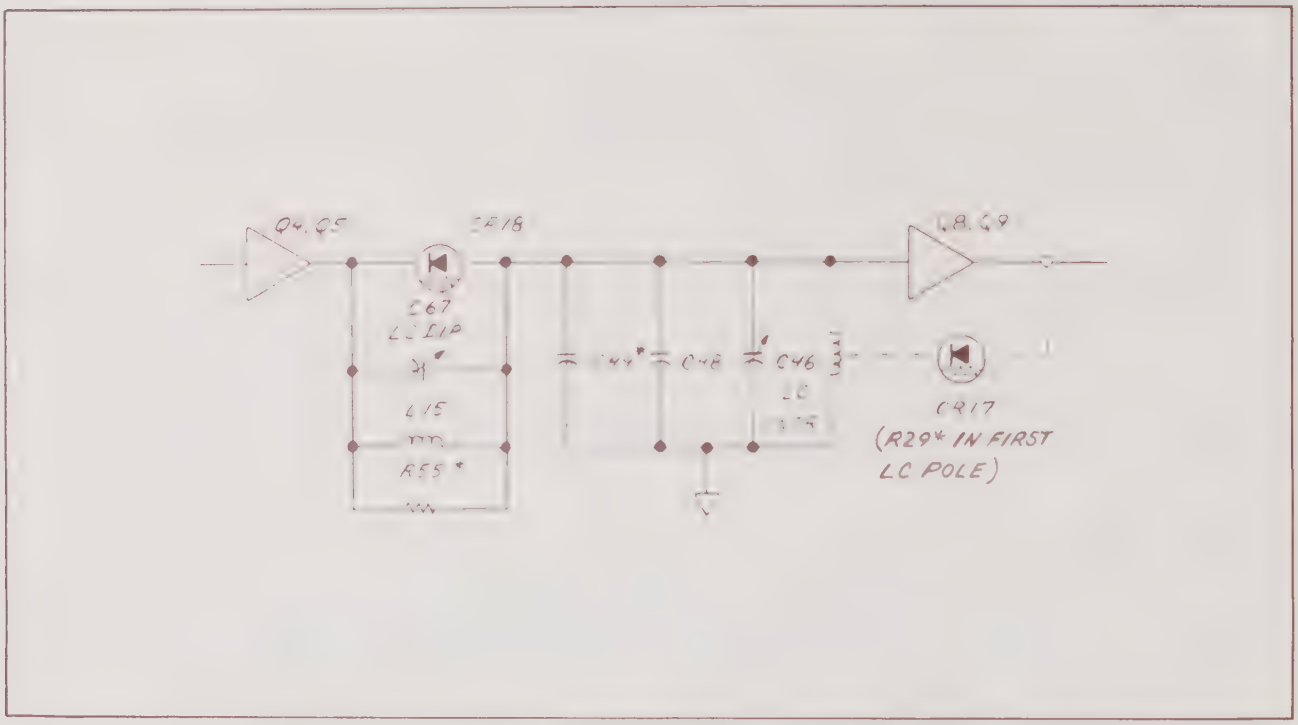


Figure 9-19. Second LC Pole Circuit, Simplified Schematic

The LC filter utilizes a metallized inductor L6 in parallel with three capacitors: C46 (LC CTR) for centering, C48 for temperature compensation, and C49*. The parallel circuit is driven through PIN diode CR18, which functions as a variable resistor. The BW7 line sets the current through CR18. Higher resistance results in narrower bandwidth.

C67 and L15 tune out the case capacitance of CR18. R55* sets the 100 kHz bandwidth when CR18 is back biased (i.e., highest resistance). CR17 is controlled by the LC adjustment R35 and compensates for losses in the parallel resonant circuit. (In the first LC Pole circuit, fixed resistor R29* replaces CR17.)

Low gain in one of the poles in the 100 kHz bandwidth is caused by:

1. The pole being centered at some frequency other than 21.4 MHz.

2. Insufficient feedback from the buffer amplifier.

3. Defective buffer amplifier that is loading the circuit.

If the 10 kHz bandwidth amplitude is all right, but that of the 300 kHz bandwidth is too low, either C66 or C67 might not be properly adjusted. If the 300 kHz amplitude is too high, the four LC poles are not tuned close enough to the same frequency. In either case, refer to Section V, Adjustments.

A4A8 ATTENUATOR— BANDWIDTH FILTER, TROUBLE SHOOTING HINTS

As an aid in troubleshooting, critical DC voltages for proper operation are indicated at several nodes on this service sheet.

If the resolution bandwidths from 3 kHz to 3 MHz have low gain and/or incorrect bandwidth, either this board or the A4A4 Bandwidth Filter board is defective. To determine which board is faulty disconnect the 97 cable from A4A8J1 and connect it to A4A6J1. If the signal is then 3 to 5 dB lower than expected (i.e., CAL OUTPUT is −13 to −15 dBm) and/or the bandwidth is 30 to 60% wider than expected (i.e., 1 MHz RES BW is 1.3 to 1.5 MHz), then A4A8 is faulty.

Control line BW5 determines whether the LC filters or the crystal filters are selected. If this line does not switch, A4A9Q7 on the IF control board should be checked. BW63 controls the crystal mode resolution bandwidths from 3 kHz to 30 kHz. The LC resolution bandwidths from 100 kHz to 3 MHz are controlled by BW7. If any of the control line voltages in Note 5 are incorrect, signals from A4A9 IF Control should be checked.

Operation of the A10dB and A20dB circuitry can be determined by the following method. Connect a 355D attenuator between the CAL OUTPUT and SIGNAL INPUT 2. Set this attenuator to 90 dB and key in the following:

CENTER FREQUENCY	20 MHz
	0 Hz
RES BW	1 kHz
ATTEN	0 dB
VIDEO BW	10 Hz
SWEEP TIME	20 sec
	−10 dBm

Press the sweep key and then repetitively press the DATA STEP ⇩ key. The figure below shows the display of a properly working instrument. If either of the first two steps is missing, then the A10 dB or A20 dB circuitry is faulty. Note 6 indicates the correct control line voltages from the A4A9 IF Control board.

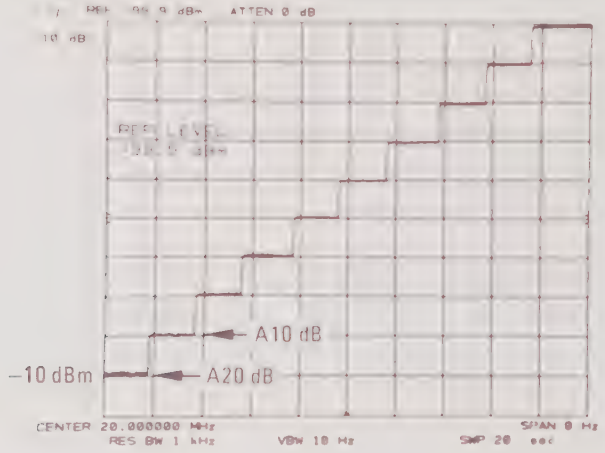


Table 9-1. A4A8 Attenuator Bandwidth Filter, Replaceable Parts (1 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A8	85662-60003	1	BOARD ASSEMBLY, ATTENUATOR-BANDWIDTH FLT	28480	85662-60003
A4A8C1	0140-0200	1	CAPACITOR-FXD 390PF +-5% 300VDC MICA 0+70	72136	DM15F391J0300WV1CR
A4A8C2	0160-2055	46	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C3	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C6	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C7	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C8	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C10			NOT ASSIGNED		
A4A8C11	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C12	0160-2257	2	CAPACITOR-FXD 10PF +-5% 500VDC CER 0+-60	28480	0160-2257
A4A8C13	0121-0059	2	CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A4A8C14*	0160-2249	2	CAPACITOR-FXD 4.7PF +-.25PF 500VDC	28480	0160-2249
A4A8C15	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C16	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C17	0160-2207	2	CAPACITOR-FXD 300PF +-5% 300VDC MICA 0+70	28480	0160-2207
A4A8C18	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C19	0160-4297	2	CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z922-CDH
A4A8C20	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C21	0160-3456	2	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A4A8C22	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C23	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C24	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C25	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C26	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C27	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C28	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C29	0121-0446	2	CAPACITOR-V TRMR-CER 4.5-20PF 160V	0146M	78-TRIKO-19 4.5-20 PF, N750
A4A8C30	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C31	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C32	0121-0036	2	CAPACITOR-V TRMR-CER 3.5-18PF 350V	73899	DV11PR18A
A4A8C33	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C34	0160-3431	2	CAPACITOR-FXD 6.8PF +-.5PF 500VDC	28480	0160-3431
A4A8C35*	0140-0194	6	CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR
A4A8C36	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C37	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C38	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C39	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z922-CDH
A4A8C40	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C41	0160-2257		CAPACITOR-FXD 10PF +-5% 500VDC CER 0+-60	28480	0160-2257
A4A8C42	0121-0059		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A4A8C43*	0160-2249		CAPACITOR-FXD 4.7PF +-.25PF 500VDC	28480	0160-2249
A4A8C44	0121-0446		CAPACITOR-V TRMR-CER 4.5-20PF 160V	0146M	78-TRIKO-19 4.5-20 PF, N750
A4A8C45	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C46	0121-0036		CAPACITOR-V TRMR-CER 3.5-18PF 350V	73899	DV11PR18A
A4A8C47	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C48	0160-3431		CAPACITOR-FXD 6.8PF +-.5PF 500VDC	28480	0160-3431
A4A8C49*	0140-0194		CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR
A4A8C50	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A4A8C51	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C52	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C53	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C54	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C55	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C56	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C57	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C58	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C59	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C60	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C61	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C62	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C63*	0140-0194		CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR
A4A8C64	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C65	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C66	0121-0452	2	CAPACITOR-V TRMR-AIR 1.3-5.4PF 250V	74970	187-0103-005
A4A8C67	0121-0452		CAPACITOR-V TRMR-AIR 1.3-5.4PF 250V	74970	187-0103-005
A4A8C68	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C69	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055

Table 9-1. A4A8 Attenuator–Bandwidth Filter, Replaceable Parts (2 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A8C70	0160-2207		CAPACITOR-FXD 300PF +-5% 300VDC MICA 0+70	28480	0160-2207
A4A8C71	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A8C72	0160-4084	2	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A8C73	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A8CR1			NOT ASSIGNED		
A4A8CR2	1901-0050	2	DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A4A8CR3	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A4A8CR4	1901-0047	10	DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A8CR5	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A8CR6	1901-1070	5	DIODE-PIN	28480	1901-1070
A4A8CR7	1901-1070		DIODE-PIN	28480	1901-1070
A4A8CR8	1901-0535	5	DIODE-SCHOTTKY	28480	1901-053
A4A8CR9	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A8CR10	1901-0535		DIODE-SCHOTTKY	28480	1901-0535
A4A8CR11	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A8CR12	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A8CR13	1901-1070		DIODE-PIN	28480	1901-1070
A4A8CR14	1901-0535		DIODE-SCHOTTKY	28480	1901-0535
A4A8CR15	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A8CR16	1901-0535		DIODE-SCHOTTKY	28480	19
A4A8CR17	1901-1070		DIODE-PIN	28480	1901-1070
A4A8CR18	1901-1070		DIODE-PIN	28480	1901-1070
A4A8CR19	1901-0535		DIODE-SCHOTTKY	28480	1901-0535
A4A8E1	9170-0029	12	CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A8E2	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A8E3	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A8E4	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A8E5	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A8E6	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A8E7	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A8E8	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A8E9	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A8E10	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A8E11	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A8E12	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A8J1	1250-0690	1	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A8L1	9100-1610	1	COIL-MLD 150NH 20% Q=50 .155DX.375LG	02178	15-4415-1M
A4A8L2	9140-0170	2	COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15-4445-7J
A4A8L3	9100-1641	2	COIL-MLD 240UH 5% Q=65 .155DX.375LG	02178	15-1315-21J
A4A8L4	9100-1618	4	COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15-4435-1K
A4A8L5	9140-0114	3	COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A4A8L6	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A4A8L7	9100-3854	2	COIL 400NH 5% Q=150 .3DX1.016LG	28480	9100-3854
A4A8L8	9140-0098	2	COIL-MLD 2.2UH 10% Q=33 .155DX.375LG	02178	15-4425-10K
A4A8L9	9100-1620	3	COIL-MLD 15UH 10% Q=65 .155DX.375LG	02178	15-4445-4K
A4A8L10	9100-1641		COIL-MLD 240UH 5% Q=65 .155DX.375LG	02178	15-1315-21J
A4A8L11	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15-4435-1K
A4A8L12	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15-4435-1K
A4A8L13	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A4A8L14	9100-3854		COIL 400NH 5% Q=150 .3DX1.016LG	28480	9100-3854
A4A8L15	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	02178	15-4445-4K
A4A8L16	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	02178	15-4445-4K
A4A8L17	9140-0098		COIL-MLD 2.2UH 10% Q=33 .155DX.375LG	02178	15-4425-10K
A4A8L18			NOT ASSIGNED		
A4A8L19	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15-4435-1K
A4A8L20	9140-0179		COIL-MLD 22UH 10% Q=75 .155DX.375LG	02178	15-4445-7J
A4A8L21-A4A8L32			NOT ASSIGNED		
A4A8L33	9140-0158	1	COIL-MLD 1UH 10% Q=32 .095DX.25LG	02178	09-4426-6K
A4A8Q1	1854-0345	1	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	02030	2N5179
A4A8Q2	1853-0007	5	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02030	2N3251
A4A8Q3	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02030	2N3251
A4A8Q4	1855-0267		TRANSISTOR J-FET N-CHAN D-MODE SI	0169H	SKA 3807
A4A8Q5	1854-0404	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A8Q6	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02030	2N3251
A4A8Q7	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02030	2N3251
A4A8Q8	1855-0267		TRANSISTOR J-FET N-CHAN D-MODE SI	0169H	SKA 3807
A4A8Q9	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02030	2N3251
A4A8Q10	1855-0267		TRANSISTOR J-FET N-CHAN D-MODE SI	0169H	SKA 3807
A4A8Q11	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A8R1	0757-0395	1	RESISTOR 56.2 1% .125W F TC=0+-100	03298	C4-1/8-T0-56R2-F
A4A8R2	0698-0083	1	RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A4A8R3	0757-0401	5	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A8R4	0757-0294	1	RESISTOR 17.8 1% .125W F TC=0+-100	0299E	MFqC1/8-T0-17R8-F
A4A8R5	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F

Table 9-1. A4A8 Attenuator–Bandwidth Filter, Replaceable Parts (3 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A8R6	2100-3053	1	RESISTOR-TRMR 20 20% C SIDE-ADJ 17-TRN	73138	89PR20
A4A8R7	2100-3052	2	RESISTOR-TRMR 50 20% C SIDE-ADJ 17-TRN	73138	89PR50
A4A8R8	0757-0416	1	RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A8R9	0698-3260	2	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A8R10	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A8R11	0757-0280	8	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A8R12	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A8R13	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A8R14	0698-3155	2	RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A8R15	0698-0082	3	RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A8R16	0698-3429	1	RESISTOR 19.6 1% .125W F TC=0+-100	03888	PMF55-1/8-T0-19R6-F
A4A8R17	0757-0443	2	RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1102-F
A4A8R18	0757-0438	6	RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A8R19			NOT ASSIGNED		
A4A8R20	0698-3441	2	RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A4A8R21	0698-3444	2	RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A8R22	0698-3442	2	RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A4A8R23	0757-0279	2	RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A8R24*	0757-0346	1	RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A8R25	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A8R26*	0757-0440	3	RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A4A8R27	0757-0290	4	RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-6191-F
A4A8R28	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-6191-F
A4A8R29*	0757-1094	2	RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A4A8R30*	0698-3152	1	RESISTOR 3.48K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3481-F
A4A8R31	0698-3156	4	RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A4A8R32	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A4A8R33	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A8R34	0698-3136	1	RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A4A8R35	2100-3098	1	RESISTOR-TRMR 100K 10% C SIDE-ADJ 17-TRN	73138	89PR100K
A4A8R36	0757-0465	1	RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A8R37			NOT ASSIGNED		
A4A8R38	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A4A8R39	0757-0442	3	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A8R40	2100-3052		RESISTOR-TRMR 50 20% C SIDE-ADJ 17-TRN	73138	89PR50
A4A8R41	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A8R42	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A8R43	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A8R44	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A8R45	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1102-F
A4A8R46	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A8R47	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A4A8R48	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A8R49	0698-3442		RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A4A8R50	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A8R51	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A8R52*	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A4A8R53	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-6191-F
A4A8R54	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFAC1/8-T0-6191-F
A4A8R55*	0757-0440		RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A4A8R56	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A4A8R57	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A4A8R58	0698-3440	1	RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A4A8R59	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A8R60	0698-3154	2	RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A4A8R61	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A4A8R62	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A8R63	0698-3443	1	RESISTOR 287 1% .125W F TC=0+-100	03298	C4-1/8-T0-287R-F
A4A8R64	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A8R65			NOT ASSIGNED		
A4A8R66	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A8R67	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A8R68	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A8R69	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A8R70	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A8TP1	0360-1788	4	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A8TP2	0360-1788		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A8TP3	0360-1514	5	TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A4A8TP4	0360-1788		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A8TP5	0360-1788		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SQ	28480	0360-1788
A4A8TP6	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A4A8TP7	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A4A8TP8	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A4A8TP9	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514

Table 9-1. A4A8 Attenuator–Bandwidth Filter, Replaceable Parts (4 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A8VR1	1902-3139	1	DIODE-ZNR 8.25V 5% DO-7 PD=.4W TC=+.053%	02230	PZ7252
A4A8Y1	0410-1026	1	CRYSTAL, 21.4 MHZ, SET OF SIX INCLUDES A4A4Y1-Y3, A4A6A1Y1) A4A8 MISCELLANEOUS	28480	0410-1026
	86701-40001	1	EXTRACTOR, PC BOARD	28480	86701-40001

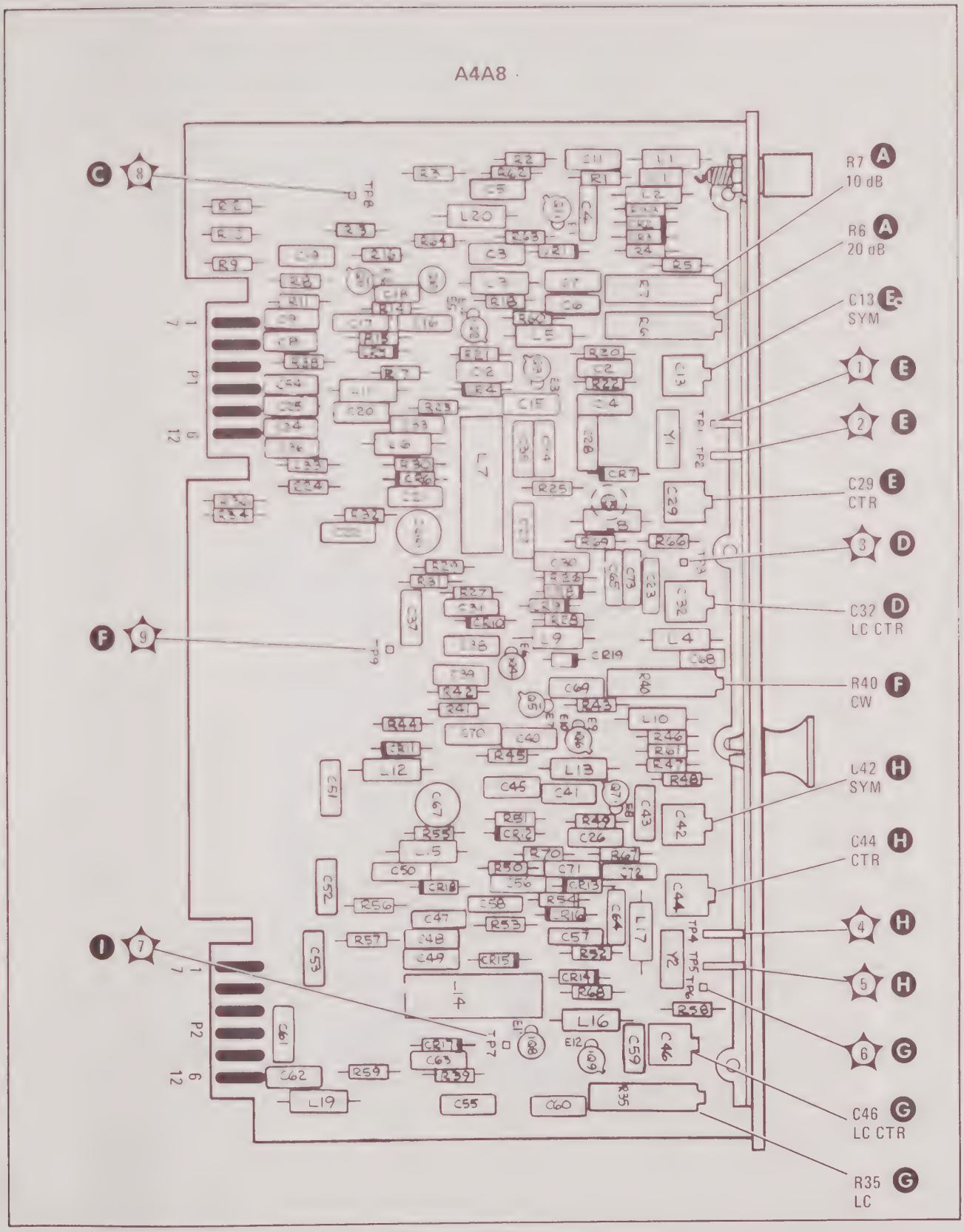


Figure 9-20. A4A8 Attenuator–Bandwidth Filter, Component Locations

A4A6A1 UP CONVERTER, CIRCUIT DESCRIPTION
(Service Sheet 4)

For narrow (≤1 kHz) bandwidths, A4A6A1 Up Converter Assembly converts the 3 MHz IF signal from A4A7 3 MHz Filter to a 21.4 MHz IF signal and sends it to A4A5 Step Gain. For wide (≥3 kHz) bandwidths, the 21.4 MHz from A4A6A2 Down Converter is amplified and sent to A4A5.

Variable Gain Amplifier (D)

The Variable Gain Amplifier has about 6 dB of gain to compensate for the loss incurred by the 50-Ohm Driver in A4A6A2, which converts the 21.4 MHz IF signal into a 50Ω system.

21.4 MHz IF Switch (B)

For wide (≥3 kHz) bandwidths, the SWITCH line goes to +15V, which turns Q6 off. This forward biases CR3 (the current is sunk through the LO Driver and Buffer Amplifier) and reverse biases CR2, allowing the 21.4 MHz IF signal to pass through CR3 and then to A4A5.

For narrow (≤1 kHz) bandwidths, the SWITCH line goes to 0V, turning Q6 on. The collector of Q6 goes to about +15V, which turns the LO Driver on, forward biases CR2, and reverse biases CR3, breaking the path from the Variable Gain Amplifier.

LO Driver and Buffer Amplifer (A)

This circuit is only on for bandwidths ≤1 kHz. It consists of an emitter follower (Q7) driving a common base stage (Q8) which in turn drives a common emitter stage (Q9). The Voltages and signal levels are indicated on the schematic.

Mixer (C)

The Mixer is double balanced and has about 6 dB conversion loss. It mixes the 3 MHz IF signal from A4A7 with the 18.4 MHz LO signal from the LO Driver and Buffer Amplifier to produce a 21.4 MHz signal through the 21.4 MHz Bandpass Amplifier to A4A5.

21.4 MHz Bandpass Amplifier (E)

This is a common emitter amplifier with about 7 dB of gain. It is preceded by a wide (BW ≈ 5 MHz) bandpass filter (R61, C32 and L2) and followed by a narrow (BW ≈ 10 kHz) bandpass (T1, Y1, L8, and R60). The wide filter attenuates harmonics of the 18.4 MHz LO, and the narrow filter attenuates the fundamental of the 18.4 MHz LO. LO NULL adjustment C31 compensates for the case capacitance of the crystal. The crystal Y1 and inverting transformer T1 are driven by an emitter follower Q4. The output emitter follower is turned on and off by the SWITCH line.

A4A6A2 DOWN CONVERTER, CIRCUIT DESCRIPTION (Service Sheet 4)

For resolution bandwidths ≤1 kHz, A4A6A2 Down Converter converts the 21.4 MHz IF signal from A20 Third Converter down to a 3 MHz IF signal. For resolution bandwidths ≥3 kHz, the 21.4 MHz is not converted but is sent through A4A6A1 Up Converter to A4A5 Step Gain.

Switch (C) and 50 Ohm Driver (A)

For bandwidths ≥3 kHz, the SWITCH line is +15V and Q7 is off. R38 in the LO Driver and Buffer Amplifier pulls the collector of Q7 to less than 0V. This forward biases CR3 and reverse biases CR5, passing the 21.4 MHz IF signal to the 50 Ohm Driver, where it is converted to a 50Ω system (6 dB loss) and sent to A4A6A1.

For bandwidths ≤1 kHz, the SWITCH line is 0V, turning Q7 on. The collector Q7 goes to almost +15V, which turns CR5 on (shorting any signal that might pass through CR3) and CR3 off. Q7 also turns the LO on.

LO Driver and Buffer Amplifier (B)

This circuit is only on for bandwidths ≤1 kHz. It consists of an emitter follower Q6 driving a common base stage Q5, which in turn drives a common emitter stage Q2. The proper bias voltages and signal leads are shown on the schematic.

Mixer and Driver (D)

Q1 is an emitter follower driving a step-down transformer. The turns ratio is about 4.1 2 to 1, which yields a 12 dB loss and drives the Mixer from a low impedance. The Mixer has an additional 5 dB loss.

3 MHz Bandpass Amplifier (E)

This amplifier compensates for the losses of the transformer T1 and the mixer M1. The filter at the output, consisting of L5, C22, and R52, has less than 1 dB of loss at 3 MHz.

A4A6 DOWN/UP CONVERTER, TROUBLESHOOTING HINTS

If the resolution bandwidths less than 3 kHz are not working properly, the fault is most likely on the Down/Up Converter or the 3 MHz Bandwidth Filter boards.

If only noise is displayed, check the voltage on the SWITCH control lines. If the SWITCH line is working, the 18.4 MHz LO signal levels should be tested. The 18.4 MHz Oscillator is located on the A4A5 Step Gain board.

A4A6A2R33* may have to be changed if mixer A4A6A2U1 is replaced. See Section V for the correct procedure for selecting this value.

Note that the SWITCH control line voltage is different on the A4A6A1 Up Converter board. This is due to a 100Ω resistor, R4, on the A4A10 IF Video Motherboard.

Table 9-2. A4A6 Down/Up Converter, Replaceable Parts (1 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A6	85662-60018	1	DOWN/UP CONVERTER ASSEMBLY (INCLUDES A4A6A1 UP CONVERTER & A4A6A2 DOWN CONVERTER)	28480	85662-60018
A4A6J1	1250-0690	2	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A6J2	1250-0690		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
			A4A6 MISCELLANEOUS PARTS		
	86701-40001	1	EXTRACTOR, PC BOARD	28480	86701-40001
A4A6A1	85662-60006	1	BOARD ASSEMBLY, UP-CONVERTER	28480	85662-60006
A4A6A1C1			NOT ASSIGNED		
A4A6A1C2	0160-2055	18	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C3			NOT ASSIGNED		
A4A6A1C4	0160-4084	2	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A6A1C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C6	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C7			NOT ASSIGNED		
A4A6A1C8			NOT ASSIGNED		
A4A6A1C9	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A6A1C10			NOT ASSIGNED		
A4A6A1C11	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C13	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C14			NOT ASSIGNED		
A4A6A1C15			NOT ASSIGNED		
A4A6A1C16	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C18	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C19	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C20	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C21	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C22	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C23	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C24	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C25	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C26	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C27	0160-2244	1	CAPACITOR-FXD 3PF +-.25PF 500VDC	28480	0160-2244
A4A6A1C28			NOT ASSIGNED		
A4A6A1C29			NOT ASSIGNED		
A4A6A1C30	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A1C31	0121-0453	1	CAPACITOR-V TRMR-AIR 1.3-5.4PF 250V	74970	187-0103-195
A4A6A1C32	0140-0199	1	CAPACITOR-FXD 240PF +-5% 300VDC MICA	72136	DM15F241J0300WV1CR
A4A6A1CR1			NOT ASSIGNED		
A4A6A1CR2	1901-0047	3	DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A6A1CR3	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A6A1CR4	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A6A1E1	9170-0029	7	CORE-SHIELDING BEAD	01886	56-590-65A2/4A
A4A6A1E2	9170-0029		CORE-SHIELDING BEAD	01886	56-590-65A2/4A
A4A6A1E3	9170-0029		CORE-SHIELDING BEAD	01886	56-590-65A2/4A
A4A6A1E4	9170-0029		CORE-SHIELDING BEAD	01886	56-590-65A2/4A
A4A6A1E5	9170-0029		CORE-SHIELDING BEAD	01886	56-590-65A2/4A
A4A6A1E6	9170-0029		CORE-SHIELDING BEAD	01886	56-590-65A2/4A
A4A6A1E7	9170-0029		CORE-SHIELDING BEAD	01886	56-590-65A2/4A
A4A6A1L1	9140-0112	2	COIL-MLD 4.7UH 10% Q=33 .155DX.375LG	02178	15.4425-14K
A4A6A1L2	9100-1611	1	COIL-MLD 220NH 20% Q=50 .155DX.375LG	02178	15.4415-2M
A4A6A1L3			NOT ASSIGNED		
A4A6A1L4	9100-1624	1	COIL-MLD 30UH 5% Q=65 .155DX.375LG	02178	15.4465-1J
A4A6A1L5	9100-1620	1	COIL-MLD 15UH 10% Q=65 .155DX.375LG	02178	15.4445-4K
A4A6A1L6			NOT ASSIGNED		
A4A6A1L7	9140-0112		COIL-MLD 4.7UH 10% Q=33 .155DX.375LG	02178	15.4425-14K
A4A6A1L8	9100-1618	1	COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.4435-1K
A4A6A1R1	0757-0401	2	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A6A1R2			NOT ASSIGNED		
A4A6A1R3			NOT ASSIGNED		
A4A6A1R4	0757-1094	1	RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A4A6A1R5	0757-0465	2	RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A6A1R6	0757-0438	1	RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A6A1R7			NOT ASSIGNED		
A4A6A1R8			NOT ASSIGNED		
A4A6A1R9	0698-3442	1	RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A4A6A1R10	0757-0400	1	RESISTOR 90.9 1% .125W F TC=0+-100	03298	C4-1/8-T0-90R9-F

Table 9-2. A4A6 Down/Up Converter, Replaceable Parts (2 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A6A1R11			NOT ASSIGNED		
A4A6A1R12	0757-0279	2	RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A6A1R13	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A6A1R14	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A6A1R15	0757-0280	4	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A6A1R16	0757-0317	1	RESISTOR 1.33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A4A6A1R17	0757-0442	5	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A6A1R18	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A6A1R19	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A6A1R20	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A6A1R21	0757-0180	2	RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A6A1R22	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A6A1R23	0757-0346	2	RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A6A1R24	0757-0416	2	RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A6A1R25	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A6A1R26	0757-0394	1	RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A6A1R27	0757-0439	1	RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A6A1R28	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A6A1R29	2100-3154	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	73138	89PR1K
A4A6A1R30	0698-3439	1	RESISTOR 178 1% .125W F TC=0+-100	03298	C4-1/8-T0-178R-F
A4A6A1R31			NOT ASSIGNED		
A4A6A1R32	0757-0819	1	RESISTOR 681 1% .125W F TC=0+-100	03298	C4-1/8-T0-681R-F
A4A6A1R33	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A6A1R34	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A6A1R35	0698-3444	1	RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A6A1R36-A4A6A1R49			NOT ASSIGNED		
A4A6A1R50	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A6A1R51	0757-0447	1	RESISTOR 16.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1622-F
A4A6A1R52-A4A6A1R59			NOT ASSIGNED		
A4A6A1R60	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A6A1R61	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A6A1T1	85662-60002	1	COIL ASSEMBLY, TRANSFORMER	28480	85662-60002
A4A6A1TP1			NOT ASSIGNED		
A4A6A1TP2	1251-0600	2	CONTACT-CONN U/W-POST-TYPE MALE DPBLOR	28480	1251-0600
A4A6A1TP3	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPBLOR	28480	1251-0600
A4A6A1Y1	0410-1029	1	CRYSTAL, 21.4 MHZ (SET OF SIX) (INCLUDES A4A6Y1-Y2, A4A4Y1-Y3)	28480	0410-1029

Table 9-2. A4A6 Down/Up Converter, Replaceable Parts (3 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A6A2	85662-60005	1	BOARD ASSEMBLY, DOWN-CONVERTER	28480	85662-60005
A4A6A2C1			NOT ASSIGNED		
A4A6A2C2	0160-2055	19	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C3			NOT ASSIGNED		
A4A6A2C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C5			NOT ASSIGNED		
A4A6A2C6			NOT ASSIGNED		
A4A6A2C7	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C8	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C10	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C11	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C13	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C15	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C16	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C18	0160-4084	2	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A6A2C19	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A6A2C20	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C21	0160-2207	1	CAPACITOR-FXD 300PF +-5% 300VDC MICA 0+70	28480	0160-2207
A4A6A2C22	0140-0193	1	CAPACITOR-FXD 82PF +-5% 300VDC	72136	DM15E820J0300WV1CR
A4A6A2C23	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C24	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C25			NOT ASSIGNED		
A4A6A2C26			NOT ASSIGNED		
A4A6A2C27	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C28	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2C29	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A6A2CR1	1901-0040	1	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A6A2CR2	1902-0049	1	DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	02235	FZ7240
A4A6A2CR3	1901-0047	2	DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A6A2CR4			NOT ASSIGNED		
A4A6A2CR5	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A6A2E1	9170-0029	4	CORE-SHIELDING BEAD	01686	56-590-65A2/4A
A4A6A2E2	9170-0029		CORE-SHIELDING BEAD	01686	56-590-65A2/4A
A4A6A2E3	9170-0029		CORE-SHIELDING BEAD	01686	56-590-65A2/4A
A4A6A2E4	9170-0029		CORE-SHIELDING BEAD	01686	56-590-65A2/4A
A4A6A2L1	9140-0111	1	COIL-MLD 3.3UH 10% Q=33 .155DX.375LG	02178	15.4425-12K
A4A6A2L2			NOT ASSIGNED		
A4A6A2L3			NOT ASSIGNED		
A4A6A2L4	9140-0112	3	COIL-MLD 4.7UH 10% Q=33 .155DX.375LG	02178	15.4425-14K
A4A6A2L5	9100-1625	1	COIL-MLD 33UH 5% Q=65 .155DX.375LG	02178	15.4465-2J
A4A6A2L6			NOT ASSIGNED		
A4A6A2L7			NOT ASSIGNED		
A4A6A2L8	9140-0112		COIL-MLD 4.7UH 10% Q=33 .155DX.375LG	02178	15.4425-14K
A4A6A2L9	9140-0112		COIL-MLD 4.7UH 10% Q=33 .155DX.375LG	02178	15.4425-14K
A4A6A2L10	9140-0114	1	COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15.4445-2K
A4A6A2R1-					
A4A6A2R3			NOT ASSIGNED		
A4A6A2R4	0698-0083	1	RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A4A6A2R5-					
A4A6A2R10			NOT ASSIGNED		
A4A6A2R11	0757-0346	4	RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A6A2R12	0757-0279	5	RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A6A2R13	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A6A2R14	0757-0394	5	RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A6A2R15	0757-0465	1	RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A6A2R16	0757-0442	4	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A6A2R17	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A6A2R18	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A6A2R19	0757-0418	2	RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A4A6A2R20	0698-0084	2	RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A6A2R21	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A6A2R22	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A6A2R23	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A6A2R24	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A6A2R25	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A6A2R26	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A6A2R27	0698-0082	2	RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A6A2R28	0757-0180	1	RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A6A2R29	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A6A2R30	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F

Table 9-2. A4A6 Down/Up Converter, Replaceable Parts (4 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A6A2R31	0757-0401	1	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A6A2R32	0698-3447	1	RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A4A6A2R33*	0757-0395	1	RESISTOR 56.2 1% .125W F TC=0+-100	03298	C4-1/8-T0-56R2-F
A4A6A2R34			NOT ASSIGNED		
A4A6A2R35	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A6A2R36			NOT ASSIGNED		
A4A6A2R37			NOT ASSIGNED		
A4A6A2R38	0757-0438	1	RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A6A2R39	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A6A2R40	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A6A2R41	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A6A2R42	0757-0418		RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A4A6A2R43-A4A6A2R49			NOT ASSIGNED		
A4A6A2R50	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A6A2R51			NOT ASSIGNED		
A4A6A2R52	0757-0280	1	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A6A2T1	85662-80001	1	COIL ASSEMBLY, TRANSFORMER	28480	85662-80001

A4A6
DOWN/UP CONVERTER

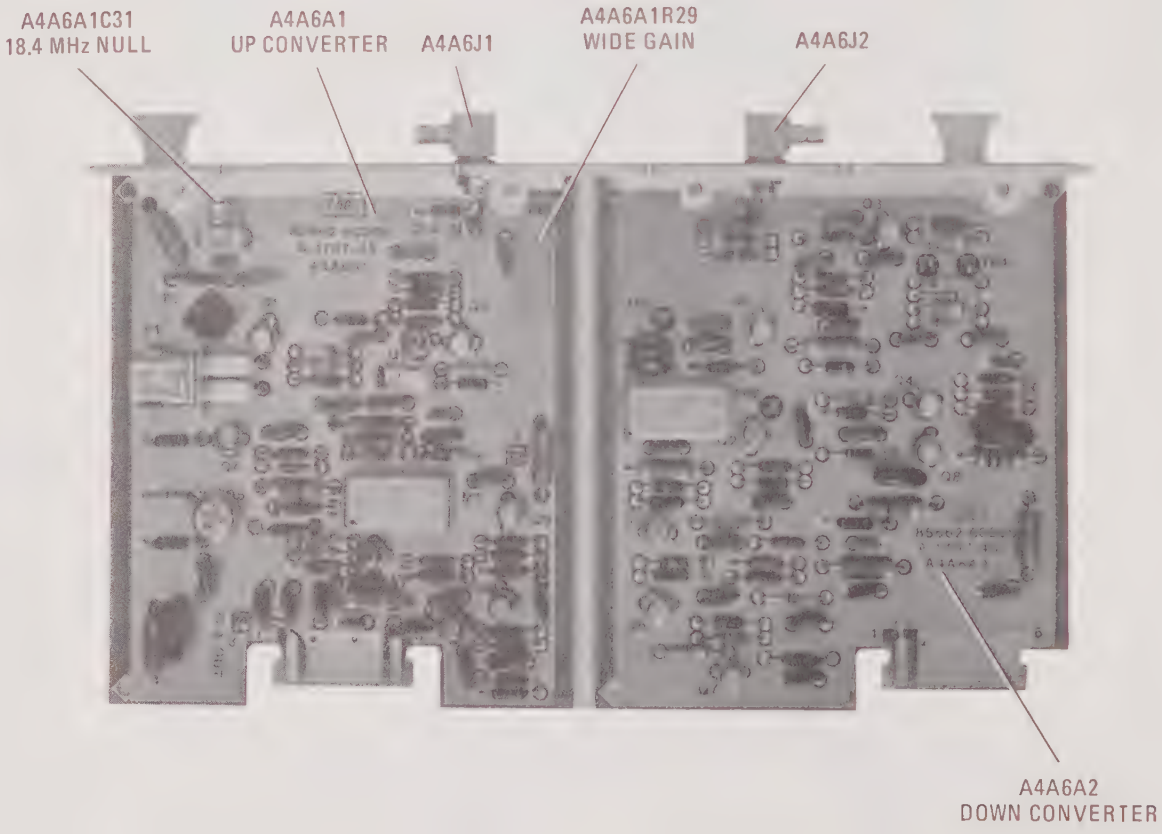


Figure 9-23. A4A6 Down/Up Converter, Assembly and Component Locations

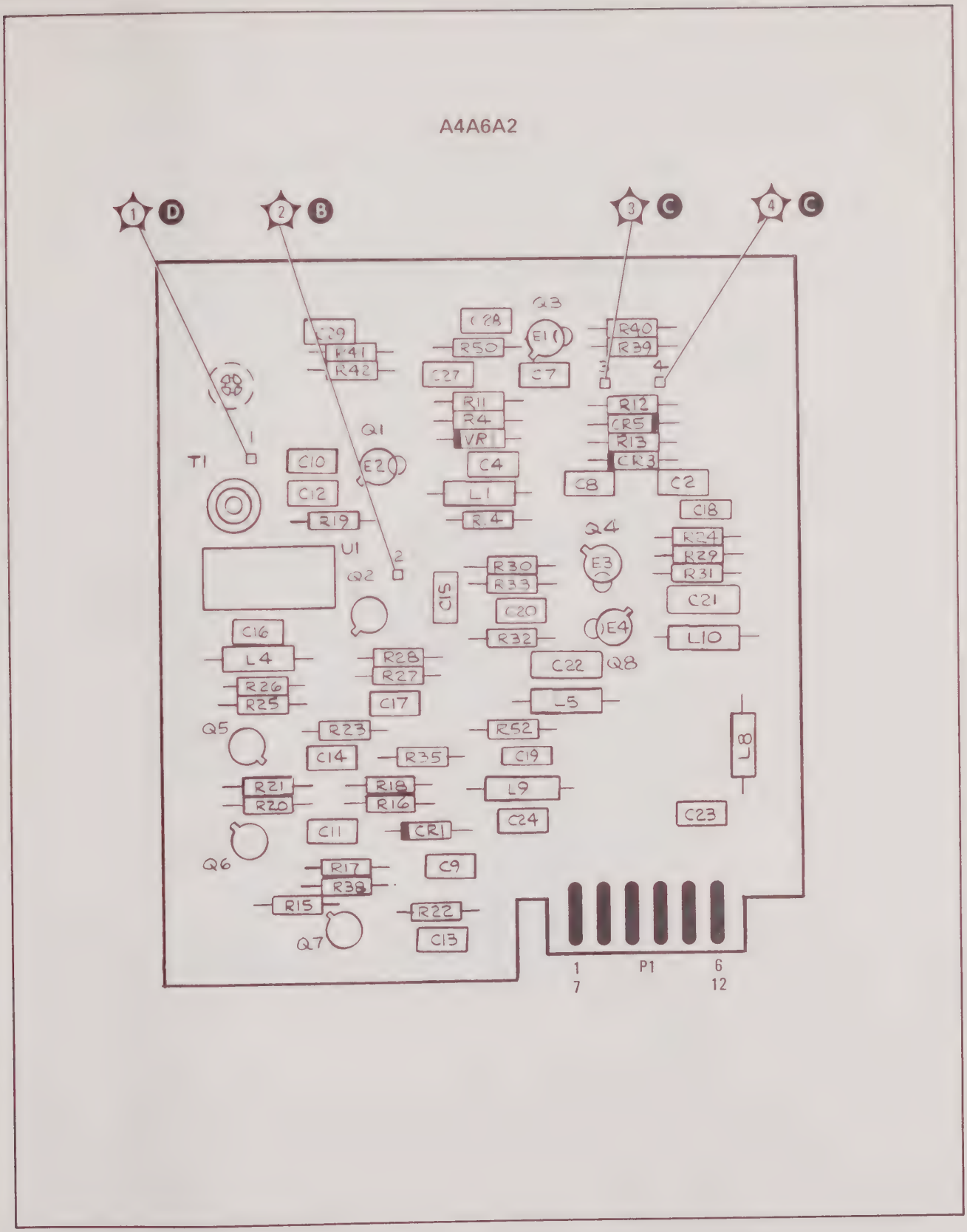


Figure 9-24. A4A6A2 Down Converter, Component Locations

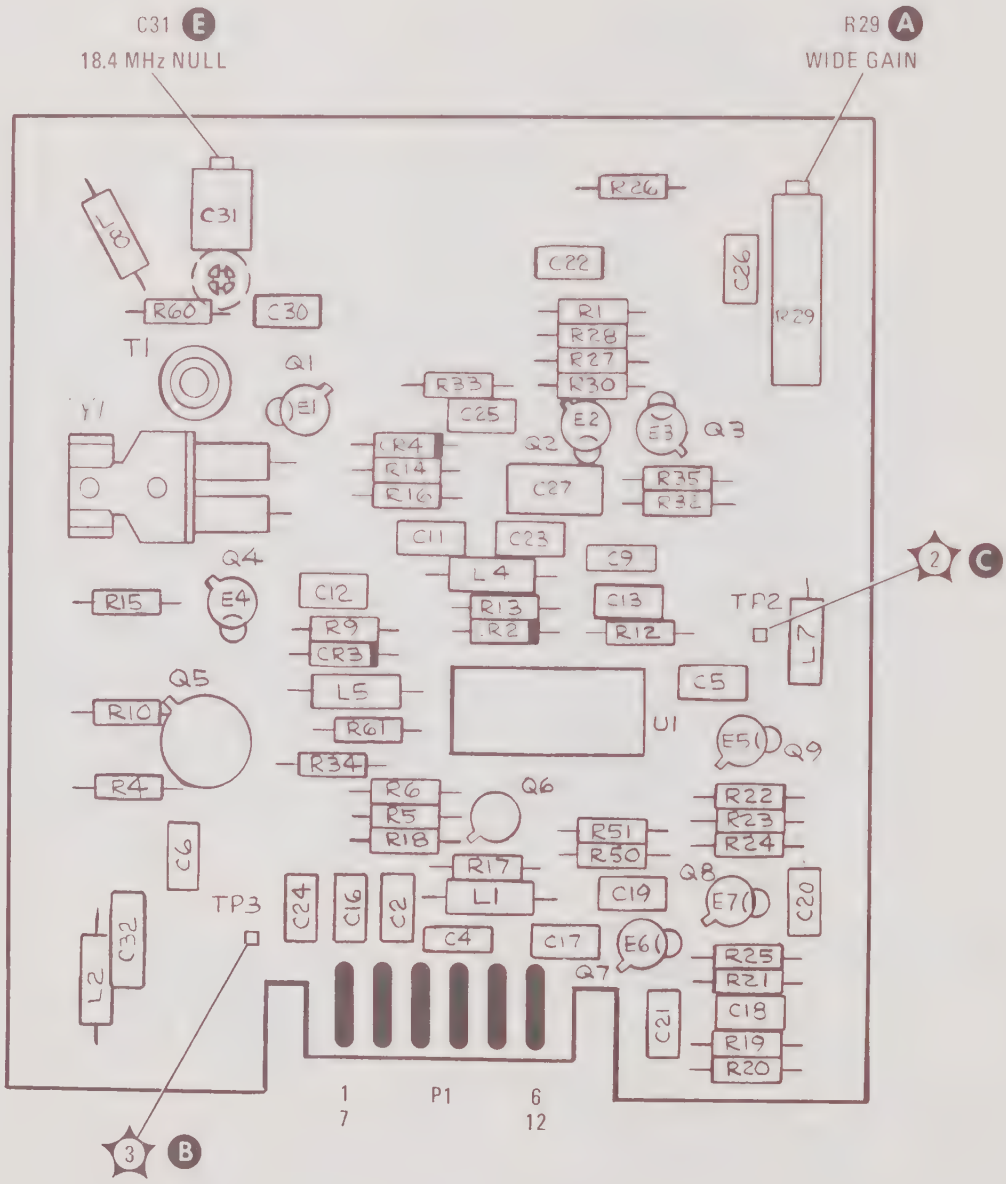


Figure 9-25. A4A6A1 Up Converter, Component Locations

A4A7 3 MHZ FILTER, CIRCUIT DESCRIPTION (Service Sheet 5)

A4A7 3 MHz Filter is a variable bandwidth filter centered at 3 MHz. The bandwidths are controlled from 10 Hz to 300 Hz in a 1, 3, 10 sequence by lines that have the same name as the bandwidth they activate. When none of the lines is activated, the filter has a 1 kHz bandwidth.

The filter has five poles which are almost identical. Only one is described in detail. Each pole has a negative output impedance to compensate for the series resistance of the crystal, but it is adjustable in only two poles.

4th Pole D

The basis of the buffer amplifier is a complementary feedback pair including Q9 and Q10 (see Figure 9-28).

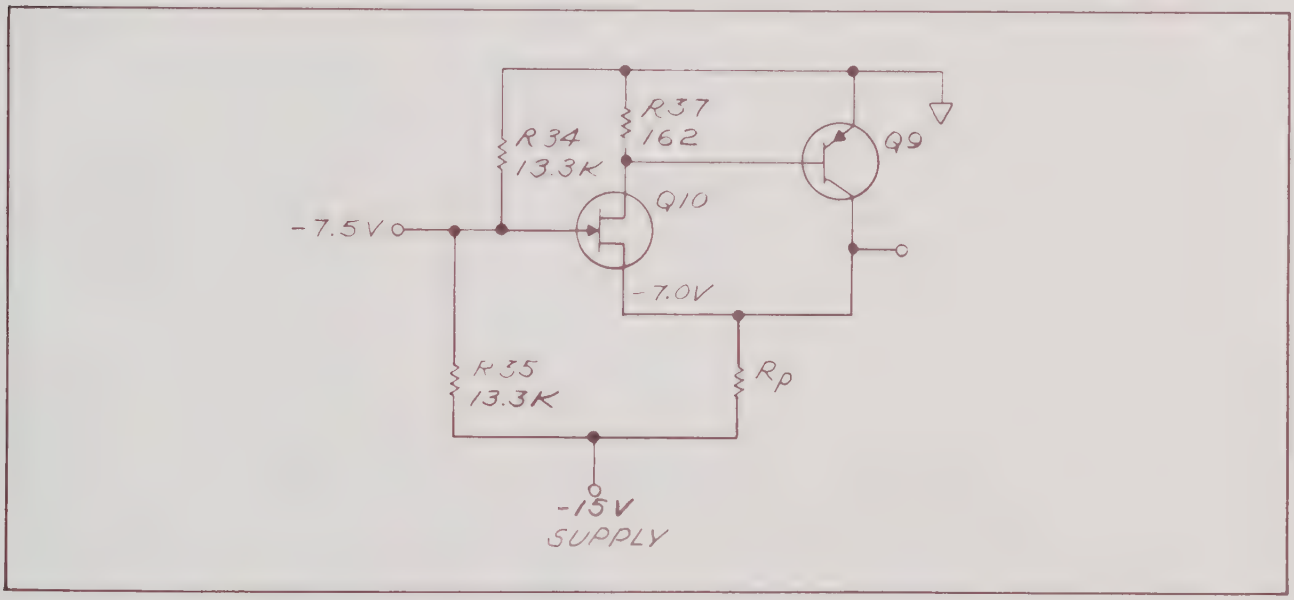


Figure 9-28. Complementary Feedback Pair, Simplified Schematic

The bias current through Q10 is $\frac{0.7V}{162\Omega} \cong 4$ mA, and the total current through Q10 plus Q9 is set by RP (P is for "phantom") to be about 20 mA. The source voltage of Q10 should always be higher than the gate voltage.

The circuit as shown in Figure 9-28 has no gain. R38, R36 and C26 are added (see schematic) so this stage has a gain of:

$$G = 1 + \frac{R38}{R36} \cong 1 \text{ dB}$$

R_P is replaced by a 20 mA current sink (see Figure 9-29).

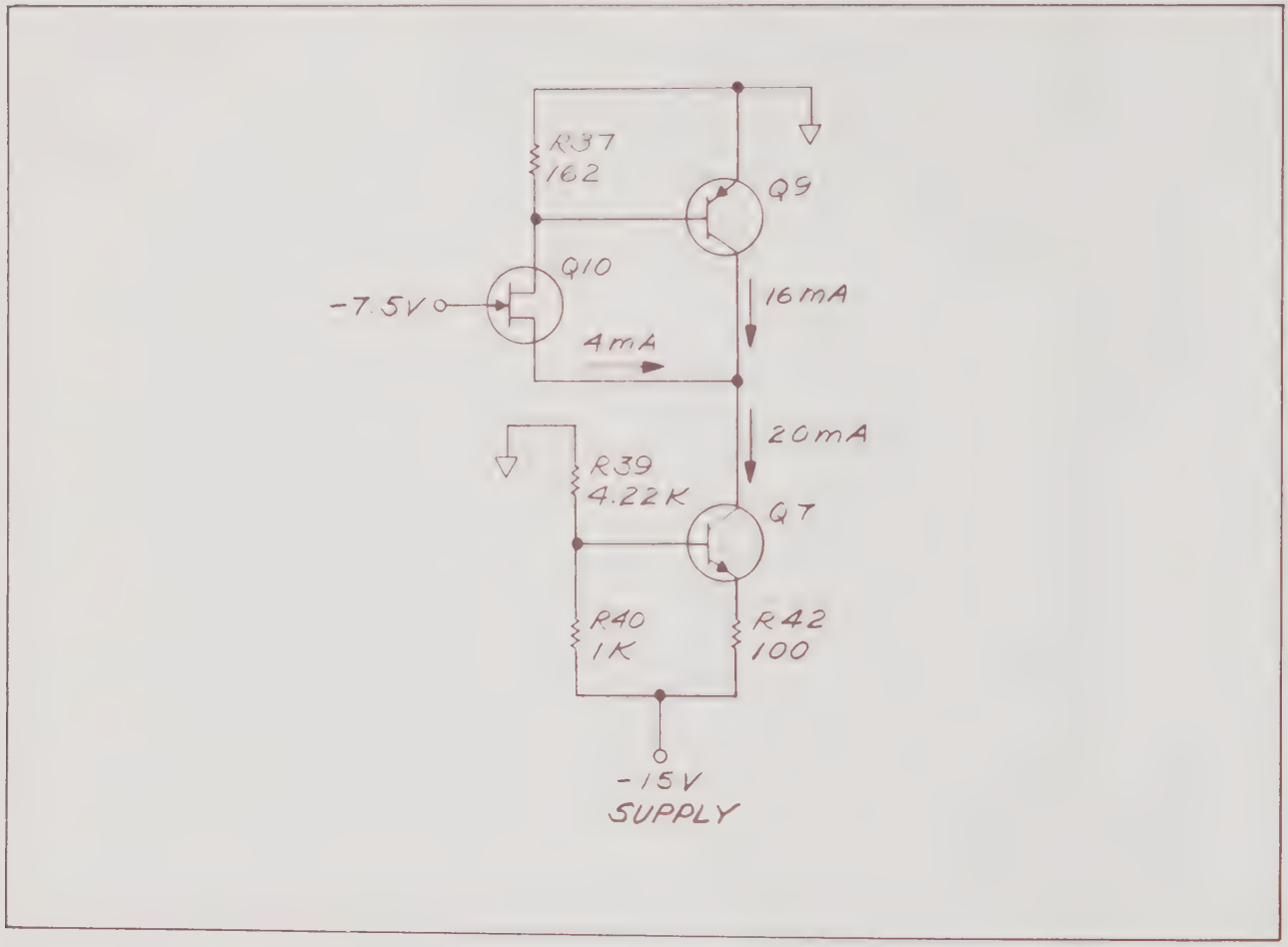


Figure 9-29. Complementary Pair with Current Sink

The description to this point is sufficient to understand how the circuit is biased. The 3 MHz operation is described in the following paragraphs.

Potentiometer R41 is added and the signal from the collector of Q9 is fed into the base of Q7 by C28 (see Figure 9-30).

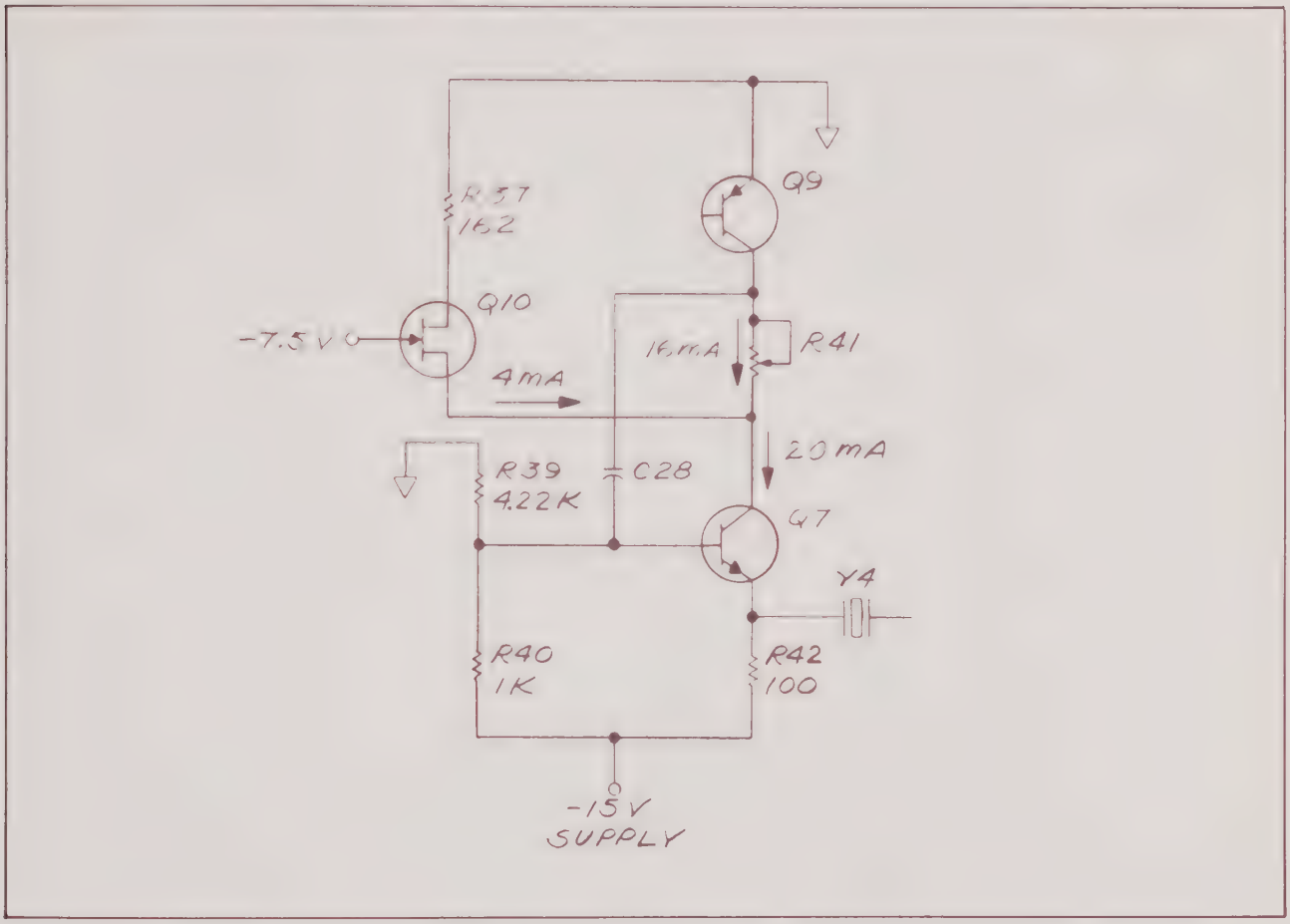


Figure 9-30. Buffer Amplifier with Negative Output Impedance

The circuit still operates the same because there is no load on the emitter of Q7 and hence no collector current. (Remember, this is AC operation.) If a load (Y4) is added to the emitter of Q7, collector current is developed and this current is feed back into the complementary pair Q9, Q10. The sense of this current is such that it is positive feedback. The more load — the more positive feedback is developed. The more positive feedback — the more gain the amplifier has. This implies negative output impedance. The magnitude of the negative output impedance is the resistance to which R41 is set.

Now the circuit can be completed.

Q8 and the SYM cap (Figure 9-31) are added to cancel the effect of the case (parallel) capacitance of the crystal. R94, R96 and other resistors are switched in to change bandwidths. C31 and C62 (not shown) are in series with the crystal to time the center frequency to precisely 3 MHz. The negative output impedances of the amplifier is set to compensate for the series resistance of the crystal so that as different bandwidths, the amplitude (overall gain) does not change. If the relative gain of the filter assembly is too low in the 10 Hz BW, and cannot be corrected by R41 and R30, it is caused by one or more of three things.

1. The series resistance of one or more of the crystals is too high.

2. The output impedance of one or more of the buffer amplifiers is not negative enough.

3. All five crystals are not tuned close enough to the same center frequency.

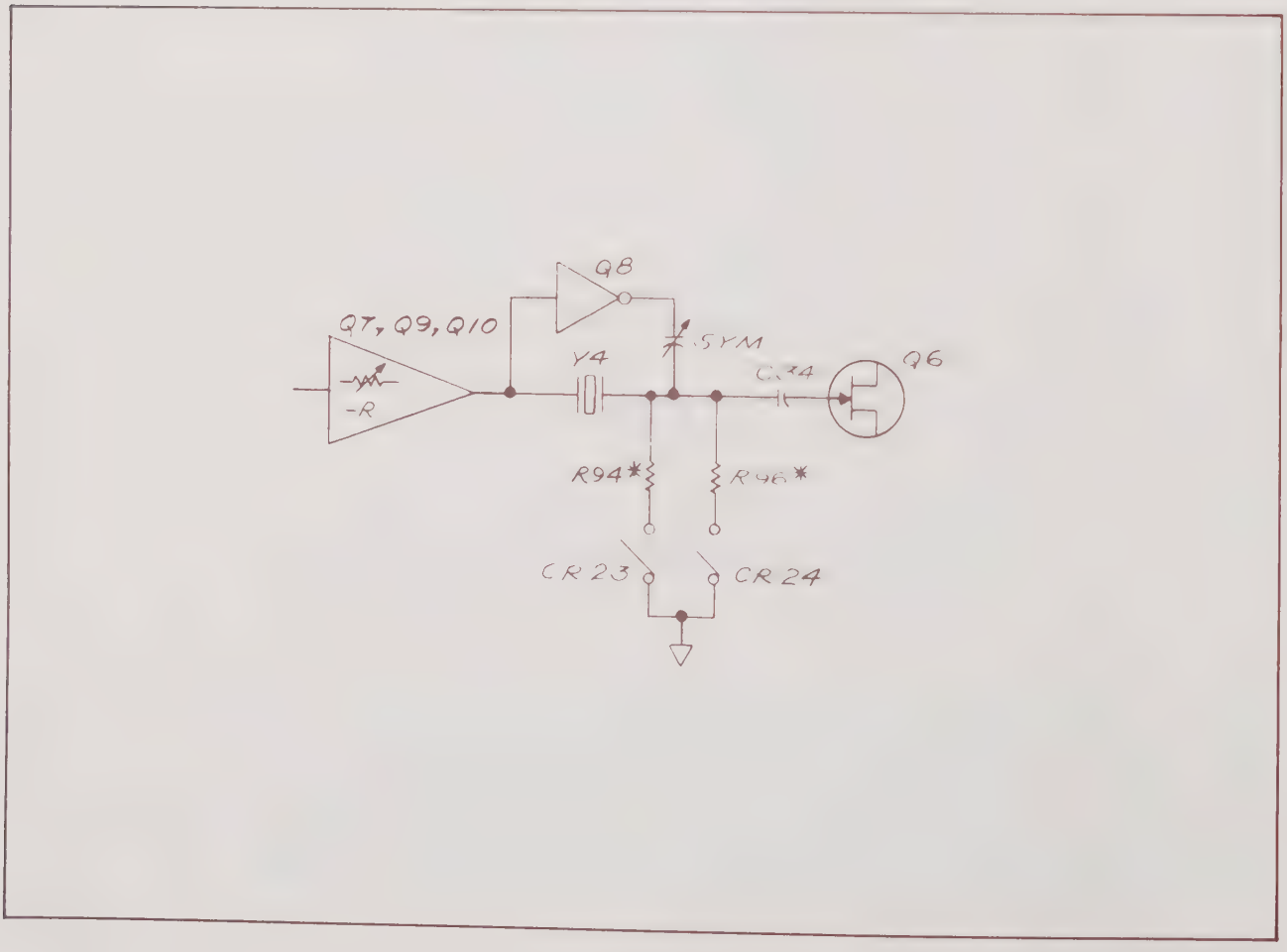


Figure 9-31. Fourth Pole, Equivalent Circuit

Table 9-3. A4A7 3 MHz Bandwidth Filter, Replaceable Parts (1 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A7	85662-60004	1	BOARD ASSEMBLY, 3 MHZ BANDWIDTH FILTER	28480	85662-60004
A4A7C1	0160-2055	37	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C2	0160-2261	1	CAPACITOR-FXD 15PF +-5% 500VDC CER0+-30	28480	0160-2261
A4A7C3	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C4	0160-2250		CAPACITOR-FXD 5.1PF +-.25PF 500VDC	28480	0160-2250
	0160-4611	5		28480	0160-4611
A4A7C6	0121-0444	5	CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	0146M	78-TRIKO-19 3-9 PF, N075
A4A7C7	0121-0105	5	CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A4A7C8	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C10	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C11	0160-2250		CAPACITOR-FXD 5.1PF +-.25PF 500VDC	28480	0160-2250
	0160-4611			28480	0160-4611
A4A7C13	0121-0493	4	CAPACITOR-V AIR DIEL 1.7-11PF 250V	74970	187-0306-105
A4A7C14	0121-0444		CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	0146M	78-TRIKO-19 3-9 PF, N075
A4A7C15	0121-0105		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A4A7C16	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C18	0160-2250		CAPACITOR-FXD 5.1PF +-.25PF 500VDC	28480	0160-2250
A4A7C19	0160-2250		CAPACITOR-FXD 5.1PF +-.25PF 500VDC	28480	0160-2250
A4A7C20	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C21*	0160-4611			28480	0160-4611
A4A7C22	0121-0493		CAPACITOR-V AIR DIEL 1.7-11PF 250V	74970	187-0306-105
A4A7C23	0121-0444		CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	0146M	78-TRIKO-19 3-9 PF, N075
A4A7C24	0121-0105		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A4A7C25	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C26	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C27	0160-2250		CAPACITOR-FXD 5.1PF +-.25PF 500VDC	28480	0160-2250
A4A7C28	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C29	0160-2250		CAPACITOR-FXD 5.1PF +-.25PF 500VDC	28480	0160-2250
A4A7C30*	0160-4611			28480	0160-4611
A4A7C31	0121-0493		CAPACITOR-V AIR DIEL 1.7-11PF 250V	74970	187-0306-105
A4A7C32	0121-0444		CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	0146M	78-TRIKO-19 3-9 PF, N075
A4A7C33	0121-0105		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A4A7C34	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C35	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C36	0160-2250		CAPACITOR-FXD 5.1PF +-.25PF 500VDC	28480	0160-2250
A4A7C37	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C38	0160-2250		CAPACITOR-FXD 5.1PF +-.25PF 500VDC	28480	0160-2250
A4A7C39*	0160-4611		CAPACITOR-FXD 0.50PF 300VDC	28480	0160-4611
A4A7C40	0121-0493		CAPACITOR-V AIR DIEL 1.7-11PF 250V	74970	187-0306-105
A4A7C41	0121-0444		CAPACITOR-V TRMR-CER 3-9PF 160V PC-MTG	0146M	78-TRIKO-19 3-9 PF, N075
A4A7C42	0121-0105		CAPACITOR-V TRMR-CER 9-35PF 200V PC-MTG	73899	DV11PR35D
A4A7C43	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C44	0160-2244	2	CAPACITOR-FXD 3PF +-.25PF 500VDC	28480	0160-2244
A4A7C45	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C46	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C47	0160-2244		CAPACITOR-FXD 3PF +-.25PF 500VDC	28480	0160-2244
A4A7C48	0160-4300	14	CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A4A7C49	0180-0197	6	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4A7C50	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4A7C51	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4A7C52	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4A7C53	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4A7C54	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4A7C55	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C56	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C57	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A4A7C58	0160-4297	5	CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A4A7C59	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C60	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C61	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C62	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C63	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A4A7C64	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A4A7C65	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C66	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C67	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C68	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C69	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A4A7C70	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH

Table 9-3. A4A7 3 MHz Bandwidth Filter, Replaceable Parts (2 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A7C71	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C72	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C73	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C74	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C75	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A4A7C76	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101H223Z522-CDH
A4A7C77	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C78	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C79	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C80	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C81	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A4A7C82	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101H223Z522-CDH
A4A7C83	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C84	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A7C85	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A4A7C86	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A4A7C87	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A4A7C88	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A4A7C89	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A4A7C90	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A4A7C91	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A4A7C92	0160-4300		CAPACITOR-FXD .047UF +80-20% 100VDC CER	0420J	C023F101L473Z822-CDH
A4A7C93*	0160-2250	9	CAPACITOR-FXD 5.1PF +-.25PF 500VDC	28480	0160-2250
A4A7CR1-A4A7CR30	1901-0040	30	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A7E1-A4A7E17	9170-0029	17	CORE-SHIELDING BEAD	01886	56-590-65A2/4A
A4A7L1	9100-1643	6	COIL-MLD 300UH 5% Q=65 .190DX.44LG	0327C	19/303
A4A7L2	9100-1648	5	COIL-MLD 560UH 5% Q=65 .190DX.44LG	02178	19-1331-29J
A4A7L3	9100-1629	5	COIL-MLD 47UH 5% Q=55 .155DX.375LG	02178	15-1315-4J
A4A7L4	9100-1643		COIL-MLD 300UH 5% Q=65 .190DX.44LG	0327C	19/303
A4A7L5	9100-1648		COIL-MLD 560UH 5% Q=65 .190DX.44LG	02178	19-1331-29J
A4A7L6	9100-1629		COIL-MLD 47UH 5% Q=55 .155DX.375LG	02178	15-1315-4J
A4A7L7	9100-1643		COIL-MLD 300UH 5% Q=65 .190DX.44LG	0327C	19/303
A4A7L8	9100-1648		COIL-MLD 560UH 5% Q=65 .190DX.44LG	02178	19-1331-29J
A4A7L9	9100-1629		COIL-MLD 47UH 5% Q=55 .155DX.375LG	02178	15-1315-4J
A4A7L10	9100-1643		COIL-MLD 300UH 5% Q=65 .190DX.44LG	0327C	19/303
A4A7L11	9100-1648		COIL-MLD 560UH 5% Q=65 .190DX.44LG	02178	19-1331-29J
A4A7L12	9100-1629		COIL-MLD 47UH 5% Q=55 .155DX.375LG	02178	15-1315-4J
A4A7L13	9100-1643		COIL-MLD 300UH 5% Q=65 .190DX.44LG	0327C	19/303
A4A7L14	9100-1648		COIL-MLD 560UH 5% Q=65 .190DX.44LG	02178	19-1331-29J
A4A7L15	9100-1629		COIL-MLD 47UH 5% Q=55 .155DX.375LG	02178	15-1315-4J
A4A7L16	9100-1643		COIL-MLD 300UH 5% Q=65 .190DX.44LG	0327C	19/303
A4A7L17	9140-0114	6	COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A4A7L18	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A4A7L19	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A4A7L20	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A4A7L21	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A4A7L22	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A4A7Q1	1853-0034	6	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A4A7Q2	1855-0081	5	TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169M	2N5245
A4A7Q3	1854-0404	5	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A7Q4	1854-0023	5	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A4A7Q5	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A4A7Q6	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169M	2N5245
A4A7Q7	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A7Q8	1854-0023		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A4A7Q9	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A4A7Q10	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169M	2N5245
A4A7Q11	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A7Q12	1854-0023		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A4A7Q13	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A4A7Q14	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169M	2N5245
A4A7Q15	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A7Q16	1854-0023		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A4A7Q17	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A4A7Q18	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169M	2N5245
A4A7Q19	1854-0023		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0023
A4A7Q20	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A7Q21	1853-0034		TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A4A7Q22	1854-0345	1	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	02036	2N5179
A4A7R1	0757-0441	1	RESISTOR 8.25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A4A7R2	0757-0442	1	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A7R3	0757-0346	1	RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A7R4	0757-0401	9	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A7R5	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F

Table 9-3. A4A7 3 MHz Bandwidth Filter Replaceable Parts (3 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A7R6	0698-3154	5	RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A4A7R7	0757-0280	5	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A7R8	0757-0379	3	RESISTOR 12.1 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-12R1-F
A4A7R9	0757-0397	1	RESISTOR 68.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-68R1-F
A4A7R10	0698-3447	6	RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A4A7R11	0757-0420	5	RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A4A7R12*	0757-0289	10	RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-1332-F
A4A7R13*	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-1332-F
A4A7R14	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A7R15	0757-0405	5	RESISTOR 162 1% .125W F TC=0+-100	03298	C4-1/8-T0-162R-F
A4A7R16	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A7R17	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A4A7R18	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A7R19	0757-0379		RESISTOR 12.1 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-12R1-F
A4A7R20	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A7R21	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A4A7R22	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A4A7R23*	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-1332-F
A4A7R24*	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-1332-F
A4A7R25	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R26	0757-0405		RESISTOR 162 1% .125W F TC=0+-100	03298	C4-1/8-T0-162R-F
A4A7R27	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A7R28	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A4A7R29	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A7R30			TRMR 20 10 SIDE-ADJ 1-TRN		72-1380
A4A7R31					C4-1/8-TO-10
A4A7R32	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A4A7R33	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A4A7R34*	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-1332-F
A4A7R35*	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-1332-F
A4A7R36	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R37	0757-0405		RESISTOR 162 1% .125W F TC=0+-100	03298	C4-1/8-T0-162R-F
A4A7R38	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A7R39	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A4A7R40	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A7R41			RESISTOR TRMR 20 10 C SIDE-ADJ 1-TRN		72-138-0
A4A7R42			RESISTOR TC=0+-100		C4-1/8-TO-101-F
A4A7R43	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A4A7R44	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A4A7R45*	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-1332-F
A4A7R46*	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-1332-F
A4A7R47	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R48	0757-0405		RESISTOR 162 1% .125W F TC=0+-100	03298	C4-1/8-T0-162R-F
A4A7R49	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A7R50	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A4A7R51	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A7R52	0757-0379		RESISTOR 12.1 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-12R1-F
A4A7R53	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A7R54	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A4A7R55	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A4A7R56*	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-1332-F
A4A7R57*	0757-0289		RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFuC1/8-T0-1332-F
A4A7R58	0757-0405		RESISTOR 162 1% .125W F TC=0+-100	03298	C4-1/8-T0-162R-F
A4A7R59	0698-3438	1	RESISTOR 147 1% .125W F TC=0+-100	03298	C4-1/8-T0-147R-F
A4A7R60	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A7R61	0698-3447		RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A4A7R62	0698-3435	1	RESISTOR 38.3 1% .125W F TC=0+-100	03298	C4-1/8-T0-38R3-F
A4A7R63	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A7R64	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A7R65	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A7R66*	0757-0394	11	RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A7R67	0698-3443	5	RESISTOR 287 1% .125W F TC=0+-100	03298	C4-1/8-T0-287R-F
A4A7R68*	0698-3437	5	RESISTOR 133 1% .125W F TC=0+-100	03298	C4-1/8-T0-133R-F
A4A7R69	0698-0082	5	RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A7R70*	0757-0416	18	RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R71	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R72*	0698-0083	5	RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A4A7R73	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R74*	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A7R75	0698-3443		RESISTOR 287 1% .125W F TC=0+-100	03298	C4-1/8-T0-287R-F
A4A7R76*	0698-3437		RESISTOR 133 1% .125W F TC=0+-100	03298	C4-1/8-T0-133R-F
A4A7R77	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A7R78*	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R79	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R80*	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A4A7R81	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R82*	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F

Table 9-3 A4A7 3 MHz Bandwidth Filter Replaceable Parts (4 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A7R83	0698-3443		RESISTOR 287 1% .125W F TC=0+-100	03298	C4-1/8-T0-287R-F
A4A7R84*	0698-3437		RESISTOR 133 1% .125W F TC=0+-100	03298	C4-1/8-T0-133R-F
A4A7R85	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A7R86*	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R87	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R88*	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A4A7R89	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R90*	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A7R91	0698-3443		RESISTOR 287 1% .125W F TC=0+-100	03298	C4-1/8-T0-287R-F
A4A7R92*	0698-3437		RESISTOR 133 1% .125W F TC=0+-100	03298	C4-1/8-T0-133R-F
A4A7R93	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A7R94*	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R95	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R96*	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A4A7R97	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R98*	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A7R99	0698-3443		RESISTOR 287 1% .125W F TC=0+-100	03298	C4-1/8-T0-287R-F
A4A7R100*	0698-3437		RESISTOR 133 1% .125W F TC=0+-100	03298	C4-1/8-T0-133R-F
A4A7R101	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A7R102*	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R103	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R104*	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A4A7R105	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A7R106	0757-0465	4	RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A7R107	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A7R108	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A7R109	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A7TP1	0360-1788	10	CONNECTOR-BBL CONT PIN .045-IN-BSC-BZ BG	28480	0360-1788
A4A7TP2	0360-1788		CONNECTOR-BBL CONT PIN .045-IN-BSC-BZ BG	28480	0360-1788
A4A7TP3	0360-1788		CONNECTOR-BBL CONT PIN .045-IN-BSC-BZ BG	28480	0360-1788
A4A7TP4	0360-1788		CONNECTOR-BBL CONT PIN .045-IN-BSC-BZ BG	28480	0360-1788
A4A7TP5	0360-1788		CONNECTOR-BBL CONT PIN .045-IN-BSC-BZ BG	28480	0360-1788
A4A7TP6	0360-1788		CONNECTOR-BBL CONT PIN .045-IN-BSC-BZ BG	28480	0360-1788
A4A7TP7	0360-1788		CONNECTOR-BBL CONT PIN .045-IN-BSC-BZ BG	28480	0360-1788
A4A7TP8	0360-1788		CONNECTOR-BBL CONT PIN .045-IN-BSC-BZ BG	28480	0360-1788
A4A7TP9	0360-1788		CONNECTOR-BBL CONT PIN .045-IN-BSC-BZ BG	28480	0360-1788
A4A7TP10	0360-1788		CONNECTOR-BBL CONT PIN .045-IN-BSC-BZ BG	28480	0360-1788
A4A7Y1	0410-0404	5	CRYSTAL:QUARTZ,MATCHED SET OF FIVE	0013F	0410-0404
A4A7Y2	0410-0404		CRYSTAL:QUARTZ,MATCHED SET OF FIVE	0013F	0410-0404
A4A7Y3	0410-0404		CRYSTAL:QUARTZ,MATCHED SET OF FIVE	0013F	0410-0404
A4A7Y4	0410-0404		CRYSTAL:QUARTZ,MATCHED SET OF FIVE	0013F	0410-0404
A4A7Y5	0410-0404		CRYSTAL:QUARTZ,MATCHED SET OF FIVE	0013F	0410-0404

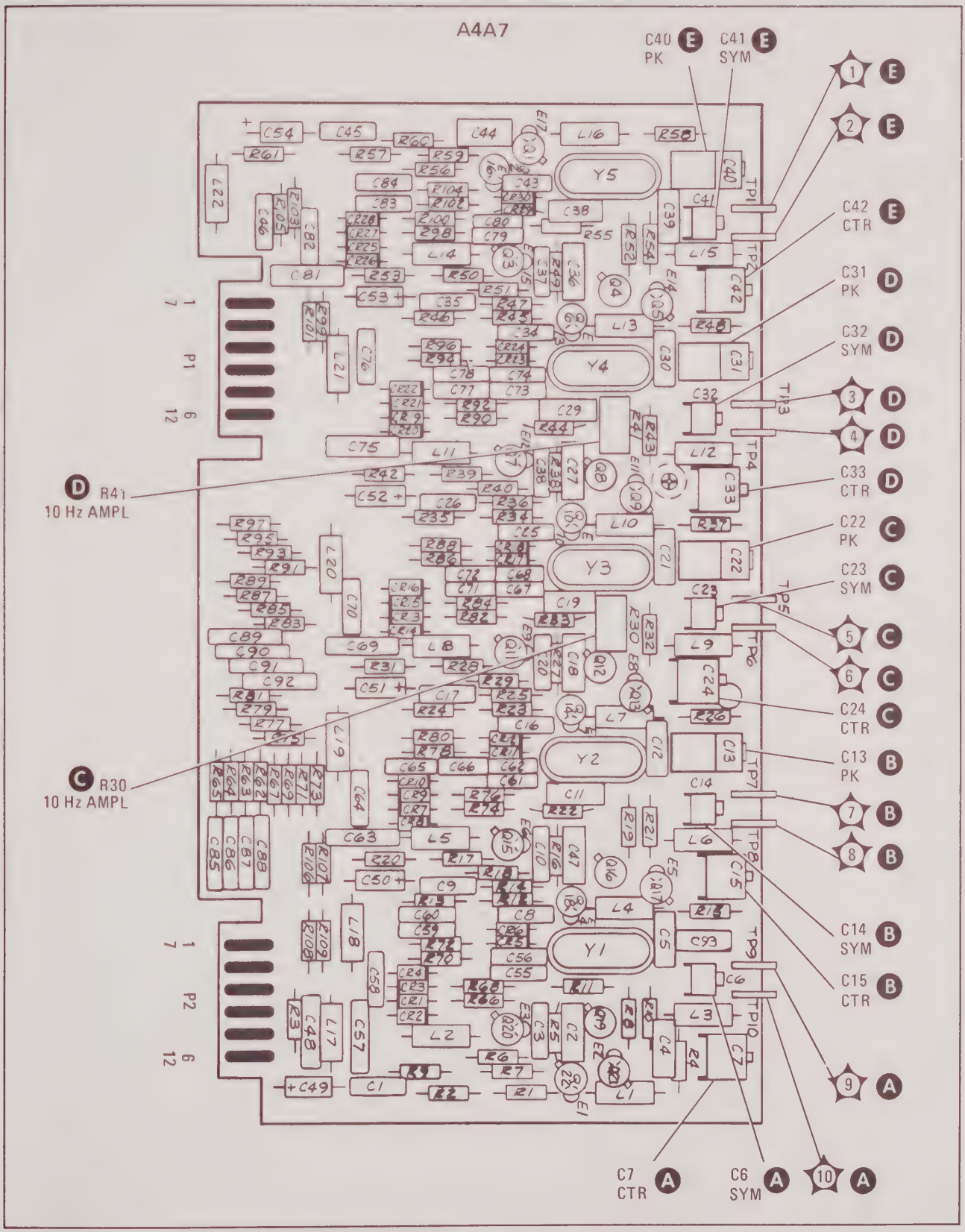


Figure 9-32. A4A7 3 MHz Bandwidth Filter, Component Locations

A4A5 STEP GAIN, CIRCUIT DESCRIPTION
(Service Sheet 6)

A4A5 Step Gain has three functions. It provides 65.9 dB of gain in discrete 0.1 dB steps (from − 15.9 dB to + 50 dB); it develops a nominal + 10V; and it provides the 18.4 MHz LO frequency to A4A6A1 Up Converter and A4A6A2 Down Converter.

Step Gain 10 dB + Calibration C

This circuit is configured as a noninverting operational amplifier. It provides a minimum of about 2 dB gain (adjustable by CAL potentiometer R33) and a maximum of about 12 dB (adjustable by 10 dB potentiometer R32.) (See Figure 9-35.) The PIN diode CR5 functions as a variable resistor that has about 1K resistance at minimum and 70Ω of resistance at maximum gain. When the SG10 line is not sinking current (SG10 is off), the PIN resistance is controlled only by R33. When the SG10 line is grounded (SG10 is on), the gain is controlled primarily by R32. If the CAL potentiometer is adjusted, R32 must be adjusted also.

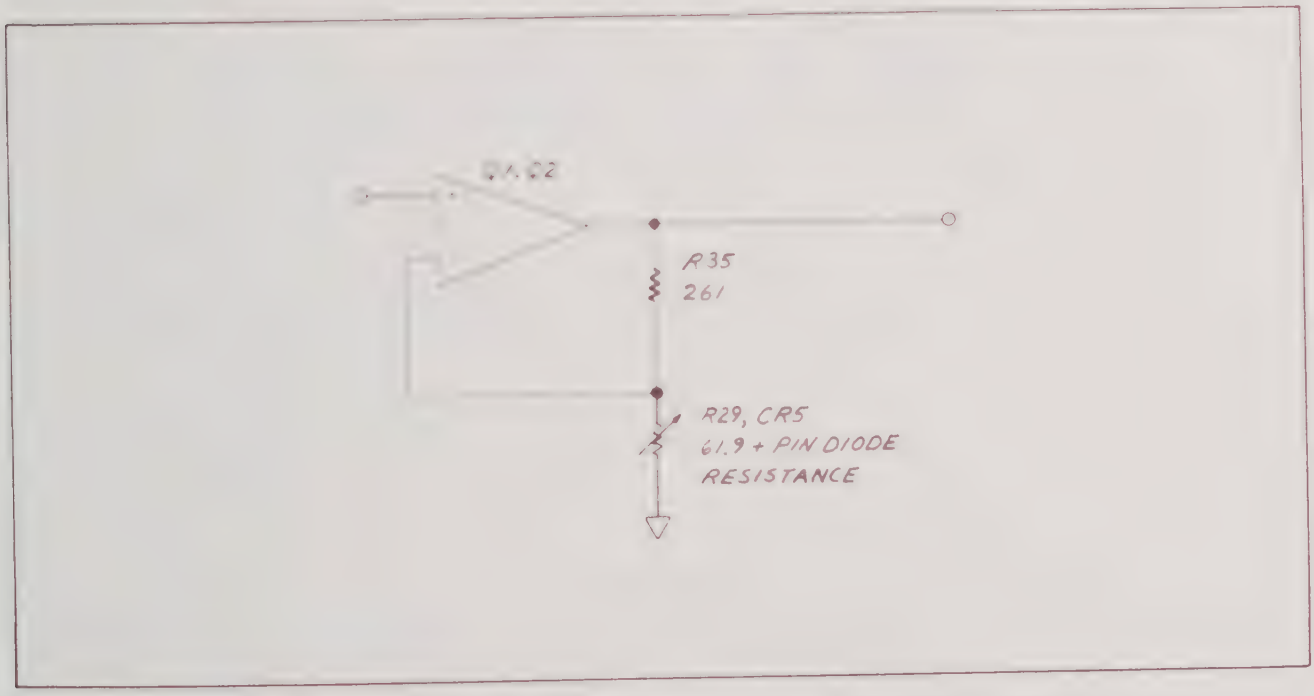


Figure 9-35. Step Gain 10 dB + Calibration, Equivalent Circuit

Step Gain 20 dB-1 D
Step Gain 20 dB-2 E

This circuit is similar to the Step Gain 10 dB + Calibration circuit, except that the gain range is from 0 dB to 20 dB. PIN diode CR6 functions as both a switch and as a variable resistor. When the SG20-1 line is low, CR6 is turned on by current adjustable by 20 dB-1 potentiometer R44. More current through the PIN causes the PIN to have a lower reistance and the amplifier to have more gain. The Step Gain 20 dB-2 circuit is identical in operation to the Step Gain 20 dB-1 circuit.

A0.0 — A15.9 dB Attenuators (F)

These attenuators normally operate over the range of 0.0 dB to 9.9 dB except in the Error Correction function (SHIFT FREQUENCY SPAN) when they operate over the whole range of 0.0 dB to 15.9 dB. The first three attenuation stages, A8dB, A4dB and A2dB, are emitter followers with a resistor divider on the output of each one. The dividers are switched in and out with diodes CR8, CR9, and CR10 to yield discrete steps of attenuation. The last attenuator is variable. Its range is adjusted by VR potentiometer R51. R51 sets the emitter voltage of Q16, which in turn determines how much current is sunk through PIN diode CR11 when resistors are switched in A4A9 Control. (See Figure 9-36.)

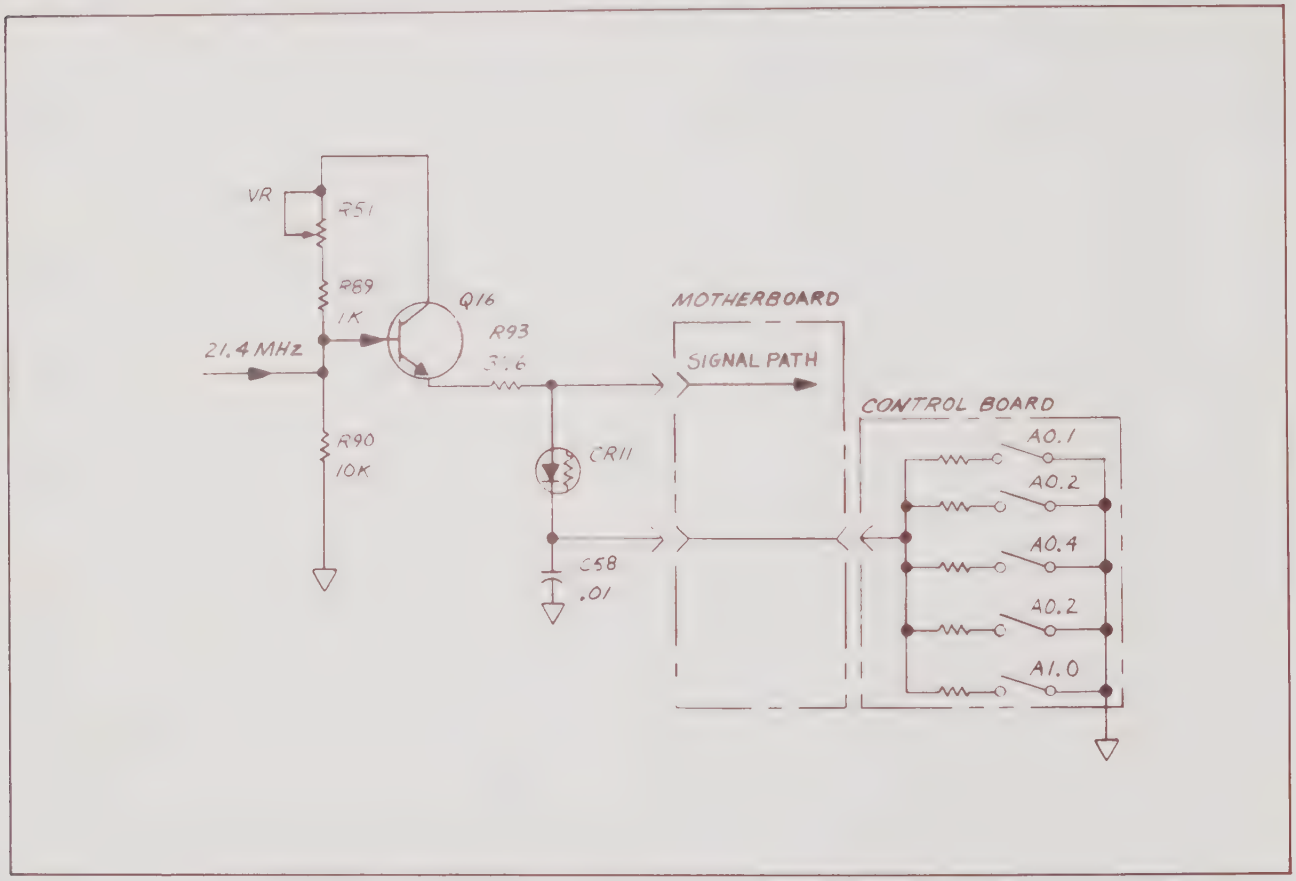


Figure 9-36. A0.0–A15.9 dB Attenuators, Simplified Schematic

+ 10V Temperature Compensating Power Supply (G)

This supply (see Figure 9-37) is used through the IF-Display Section to compensate for the effect of temperature on PIN diodes. Its nominal voltage is +10V and its nominal temperature compensation is +35 mV/°C. The output voltage is equal to the voltage at pin 3 minus the voltage difference on the cathode of CR2 times the gain of the op amp:

$$V_O = [3V - (3V - 1.8V)]\ [-\frac{51.1K}{9.09K}] \cong 10V \text{ (at room temperature)}$$

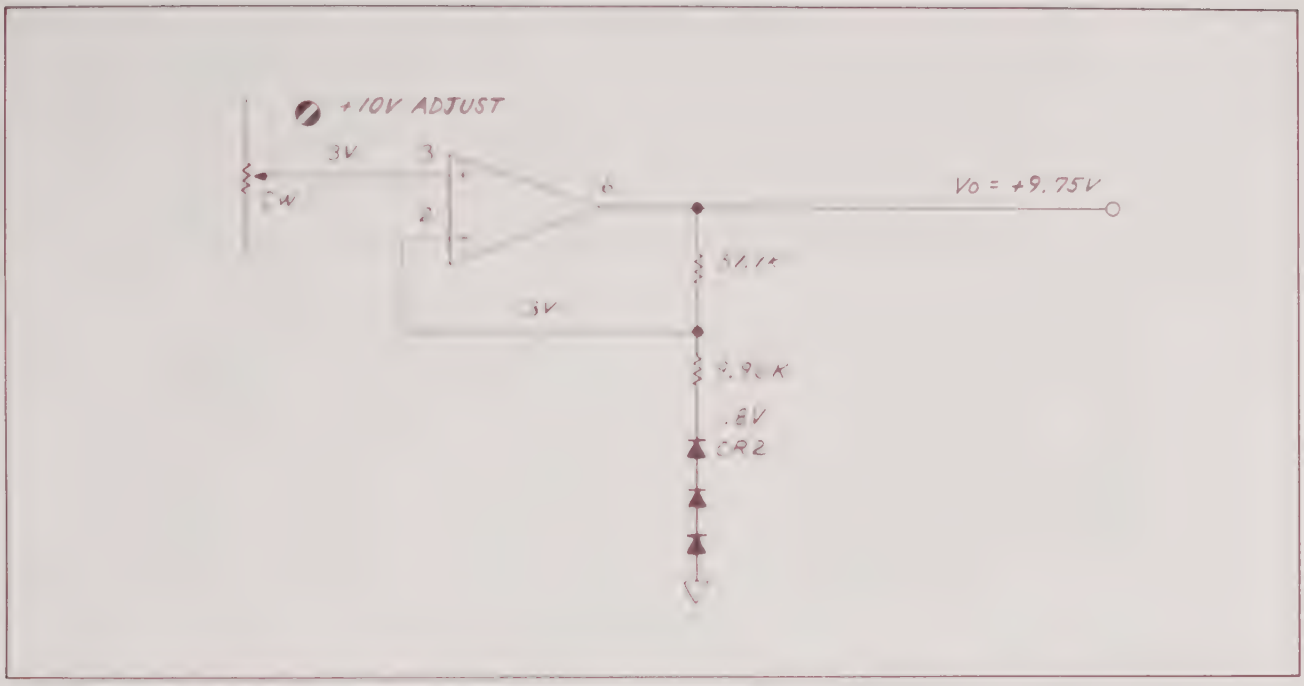


Figure 9-37. +10V Temperature-Compensating Power Supply, Simplified Schematic

18.4 MHz Oscillator A

The 18.4 MHz Oscillator is basically a Colpitts oscillator with a crystal Y1 in the feedback path. A simplified schematic is shown in Figure 9-38.

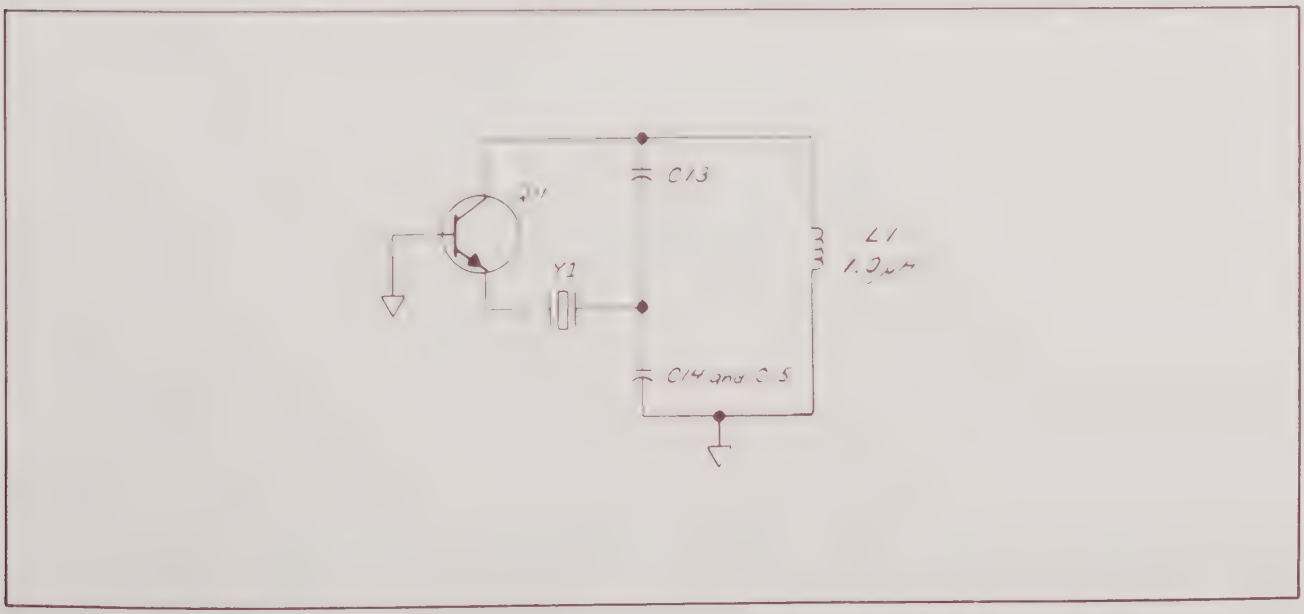


Figure 9-38. 18.4 MHz Oscillator, Equivalent Circuit

If the crystal were replaced with a large capacitor, the circuit would oscillate at the resonant frequency of the parallel resonant circuit made up of L1, C13, C14, and C15. When the crystal is inserted, the feedback path is broken except at the series resonance of the crystal (18.4 MHz). The parallel combination of varactor CR1, temperature-compensating capacitor C7, and FREQ ZERO COARSE air-variable capacitor C10 are in series with the crystal and can pull it several kHz either side of 18.4 MHz.

The voltage output is determined by the current through R10* times the collector load. If the output is too low, R10* can be decreased in size.

The collector voltage is divided by C13, C14, and C15 and goes to the Buffer Amplifiers. The division ratio is:

$$\frac{\frac{1}{390}}{\frac{1}{390}+\frac{1}{82}} \cong 0.2$$

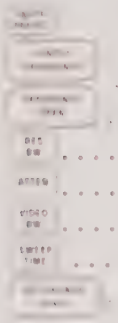
Buffer Amplifiers C

The Buffer Amplifiers are two almost identical amplifier circuits. The top amplifier on the schematic (Q10, Q8) provides the 18.4 MHz LO signal to A4A6A1 Up Converter, while the bottom amplifier (Q12, Q13) provides the signal to A4A6A2 Down Converter.

A4A5 STEP GAIN, TROUBLESHOOTING HINTS

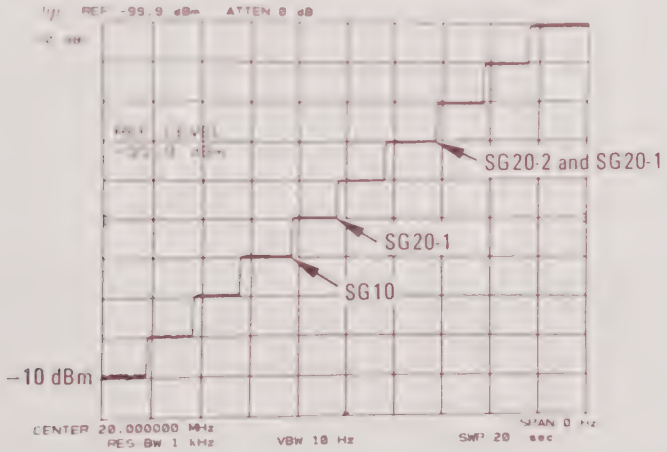
Operation of the Step Gains and A0.0 to A15.9 Attenuator can be determined from the display by several easy tests.

The Step Gains are checked in the following way. Connect a 10 dB step attenuator between CAL OUTPUT and SIGNAL INPUT 2. Set this attenuator to 90 dB, and key in the following:



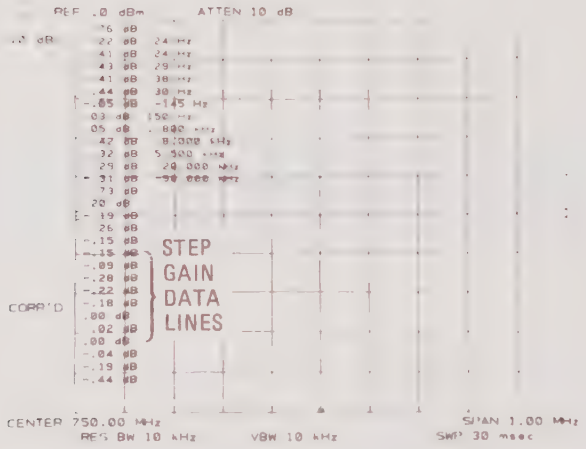
20 MHz
0 Hz
1kHz
0 dB
10 Hz
20 Sec
-10 dBm

Press the sweep key and then repetitively press the DATA STEP key. The following figure should be displayed. If one or more of the steps is missing refer to NOTE 8 for the Step Gain truth table to determine which stage is faulty. 0V in the table indicates that a control line is active.



If a component has been replaced, a simple calibration/diagnostic program exists. The calibration routine is started by connecting a cable from CAL OUTPUT to SIGNAL INPUT 2 and then pressing SHIFT FREQUENCY SPAN. When this program has finished, press SHIFT LINE TRIGGER which will list the calibration data. Lines 19 through 26 give the step gain errors. Acceptable error is ±1 dB. The order is as follows:

Reference Level (dBm)	–10	–20	–30	–40	–50	–60	–70	–80
Step Gain Control Line	A20 dB	A10 dB		SG10	SG20-1	SG10 SG20-1	SG20-1 SG20-2	SG10 SG20-1 SG20-2
Calibration Data Line	26	25	24	23	22	21	20	19



The A2dB, A4dB, and A8dB circuitry of the A0.0 to A15.9 Attenuator is activated by the following routine. First, connect a 1 dB step attenuator between CAL OUTPUT and SIGNAL INPUT 2. Set this attenuator to 10 dB and key in the following:

INSTR PRESET

CENTER FREQUENCY ..... 20 MHz

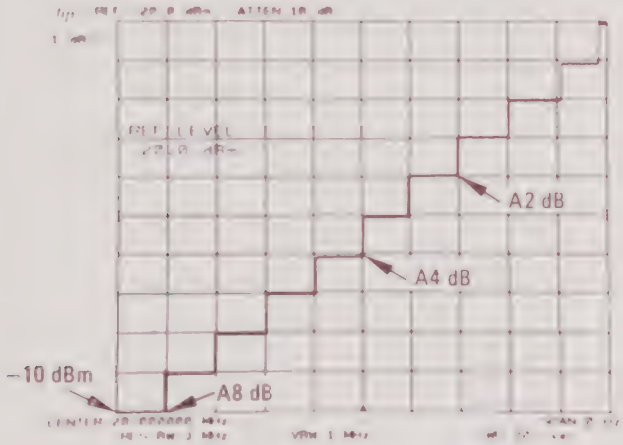
FREQUENCY SPAN ..... 0 Hz

LOG SCALE (ENTER dB/DIV) ..... 1 dB

SWEEP TIME ..... 20 sec

REFERENCE LEVEL ..... –10 dBm

Press [sweep] sweep and repetitively press the DATA STEP ◇ key. The display should appear as in the following figure. If every other step is missing, the AVdB control line is faulty. Check the A1dB circuitry on the A4A9 IF control board to find the defective component. If only a few steps are missing, refer to the truth table in Note 9 to determine which function isn't operating properly. 0V in the table indicates that a line is active.



Often several steps will appear to be slightly in error. Analysis of the truth table in Note 9 will indicate that no single stage could be faulty. This is caused by log fidelity error in the log amplifier circuitry. If accurate determination of the step size is necessary, IF substitution using a calibrated 1 dB step attenuator will be required.

Operation of the AVdB control line and the 0.1—1.9 dB section of the A0.0—A15dB Attenuator can be tested with the following method. Connect a 1 dB step attenuator between CAL OUTPUT and SIGNAL INPUT 2. Set this attenuator to 7 dB and key in the following:

INSTR PRESET
CENTER FREQUENCY ..... 20 MHz
FREQUENCY SPAN ..... 0 Hz
LOG SCALE ENTER dB/DIV ..... 1 dB
SWEEP TIME ..... 20 sec
REFERENCE LEVEL ..... −10 dBm

Press the sweep key and rotate the DATA control knob in a counterclockwise direction. A stepped display similar to the figure below should result. If the steps are not monotonic, the circuitry is faulty. The AVdB control line voltage for a −10 dBm Reference Level will vary widely among instruments although the ratio between the voltage for −11.9 dBm and −10 dBm will remain constant. During the above test the voltage should vary approximatley 7.5% from −10 dBm to −11.9 dBm. Refer to A4A9 IF Control Service Sheet for more troubleshooting information.

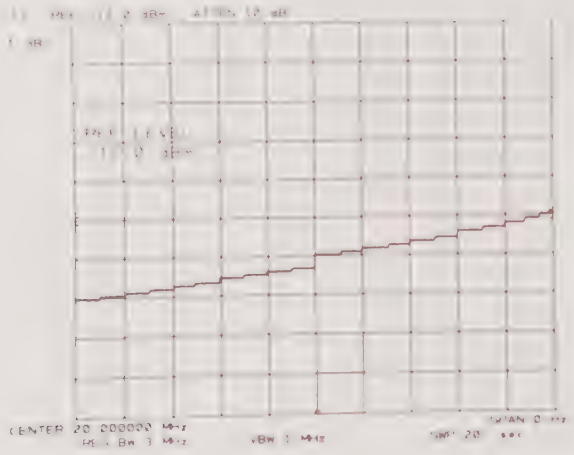


Table 9-4. A4A5 Step Gain, Replaceable Parts (1 of 3)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A5	85662-60007	1	BOARD ASSEMBLY, STEP GAIN	28480	85662-60007
A4A5C1	0160-4297	3	CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDM
A4A5C2			NOT ASSIGNED		
A4A5C3	0160-2055	40	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C4	0180-0197	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4A5C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C6			NOT ASSIGNED		
A4A5C7			NOT ASSIGNED		
A4A5C8	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C9			NOT ASSIGNED		
A4A5C10	0121-0451	1	CAPACITOR-V TRMR-AIR 1.7-11PF 250V	74970	187-0106-005
A4A5C11	0160-0127	1	CAPACITOR-FXD 10PF +-20% 25VDC CER	28480	0160-0127
A4A5C12			NOT ASSIGNED		
A4A5C13	0140-0193	1	CAPACITOR-FXD 82PF +-5% 300VDC	72136	DM15E820J0300WV1CR
A4A5C14	0180-3538	2	CAPACITOR-FXD .01UF +-5% 100VDC	28480	
A4A5C15	0140-2265		CAPACITOR-FXD [illegible] +-5% 100VDC MICA	28480	0140-2200
A4A5C16	0140-2200		NOT ASSIGNED		
A4A5C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C18	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C19	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C20	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C21	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C22	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C23	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C24	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDM
A4A5C25	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDM
A4A5C26	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C27	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C28	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C29	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C30			NOT ASSIGNED		
A4A5C31	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C32	0160-2252	1	CAPACITOR-FXD 6.2PF +-.25PF 500VDC	28480	0160-2252
A4A5C33	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C34	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C35	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C36	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C37	0160-2244	2	CAPACITOR-FXD 3PF +-.25PF 500VDC	28480	0160-2244
A4A5C38	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C39	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C40	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C41	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C42	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C43			NOT ASSIGNED		
A4A5C44	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C45	0160-2244		CAPACITOR-FXD 3PF +-.25PF 500VDC	28480	0160-2244
A4A5C46	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C47	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C48	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C49	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C50	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C51	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C52	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C53	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C54	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C55	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C56	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C57	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C58	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C59	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C60			NOT ASSIGNED		
A4A5C61			NOT ASSIGNED		
A4A5C62			NOT ASSIGNED		
A4A5C63	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A5C64	0180-2216	1	CAPACITOR-FXD 350UF+75-10% 16VDC AL	0420J	30D397G016DM2
A4A5CR1	0122-0255	1	DIODE-VVC 1N5144 22PF 10% C4/C60-MIN=3.2	02035	1N5144
A4A5CR2	1901-0040	8	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A5CR3	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A5CR4	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A5CR5	1901-1070	4	DIODE-PIN	28480	1901-1070
A4A5CR6	1901-1070		DIODE-PIN	28480	1901-1070
A4A5CR7	1901-1070		DIODE-PIN	28480	1901-1070
A4A5CR8	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A5CR9	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A5CR10	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040

Table 9-4. A4A5 Step Gain, Replaceable Parts (2 of 3)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A5CR11	1901-1070		DIODE-PIN	28480	1901-1070
A4A5CR12	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A5CR13	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A5E1	9170-0029	13	CORE-SHIELDING BEAD	01880	56-590-65A2/4A
A4A5E2	9170-0029		CORE-SHIELDING BEAD	01880	56-590-65A2/4A
A4A5E3	9170-0029		CORE-SHIELDING BEAD	01880	56-590-65A2/4A
A4A5E4	9170-0029		CORE-SHIELDING BEAD	01880	56-590-65A2/4A
A4A5E5	9170-0029		CORE-SHIELDING BEAD	01880	56-590-65A2/4A
A4A5E6	9170-0029		CORE-SHIELDING BEAD	01880	56-590-65A2/4A
A4A5E7	9170-0029		CORE-SHIELDING BEAD	01880	56-590-65A2/4A
A4A5E8	9170-0029		CORE-SHIELDING BEAD	01880	56-590-65A2/4A
A4A5E9	9170-0029		CORE-SHIELDING BEAD	01880	56-590-65A2/4A
A4A5E10	9170-0029		CORE-SHIELDING BEAD	01880	56-590-65A2/4A
A4A5E11	9170-0029		CORE-SHIELDING BEAD	01880	56-590-65A2/4A
A4A5E12	9170-0029		CORE-SHIELDING BEAD	01880	56-590-65A2/4A
A4A5E13	9170-0029		CORE-SHIELDING BEAD	01880	56-590-65A2/4A
A4A5L1	9140-0096	1	COIL-MLD 1UH 10% Q=50 .155DX.375LG	02178	15.4425-6K
A4A5L2			NOT ASSIGNED		
A4A5L3	9100-1618	3	COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.4435-1K
A4A5L4	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.4435-1K
A4A5L5	9100-1624	6	COIL-MLD 30UH 5% Q=65 .155DX.375LG	02178	15.4465-1J
A4A5L6	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.4435-1K
A4A5L7			NOT ASSIGNED		
A4A5L8			NOT ASSIGNED		
A4A5L9			NOT ASSIGNED		
A4A5L10	9100-1624		COIL-MLD 30UH 5% Q=65 .155DX.375LG	02178	15.4465-1J
A4A5L11	9100-1624		COIL-MLD 30UH 5% Q=65 .155DX.375LG	02178	15.4465-1J
A4A5L12	9100-1624		COIL-MLD 30UH 5% Q=65 .155DX.375LG	02178	15.4465-1J
A4A5L13	9100-1624		COIL-MLD 30UH 5% Q=65 .155DX.375LG	02178	15.4465-1J
A4A5L14	9100-1624		COIL-MLD 30UH 5% Q=65 .155DX.375LG	02178	15.4465-1J
A4A5Q1	1854-0345	3	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	02030	2N5179
A4A5Q2	1853-0015	3	TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A4A5Q3	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	02030	2N5179
A4A5Q4	1853-0015		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A4A5Q5	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	02030	2N5179
A4A5Q6	1853-0015		TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A4A5Q7	1854-0404	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A5Q8	1854-0019	9	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5Q9	1853-0281	1	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02030	2N2907A
A4A5Q10	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5Q11	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5Q12	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5Q13	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5Q14	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5Q15	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5Q16	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5Q17	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A5R1	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A5R2	2100-3103	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	73138	89PR10K
A4A5R3	0757-0440	1	RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A4A5R4	0757-0458	1	RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A4A5R5	0757-0288	1	RESISTOR 9.09K 1% .125W F TC=0+-100	0299E	MFBC1/8-T0-9091-F
A4A5R6	0757-0442	9	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A5R7	0757-0465	3	RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A5R8	0698-3156	1	RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A4A5R9	0698-3153		RESISTOR 3.83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A4A5R10*	0698-3153	2	RESISTOR 3.83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A4A5R11	0757-1094	1	RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A4A5R12	0698-3260	8	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A5R13	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A5R14	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A5R15	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A5R16	0757-0403	2	RESISTOR 121 1% .125W F TC=0+-100	03298	C4-1/8-T0-121R-F
A4A5R17	0757-0346	3	RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A5R18	0698-3444	5	RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A5R19	0757-0399	2	RESISTOR 82.5 1% .125W F TC=0+-100	03298	C4-1/8-T0-82R5-F
A4A5R20	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A5R21	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A5R22	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A5R23	0757-0399		RESISTOR 82.5 1% .125W F TC=0+-100	03298	C4-1/8-T0-82R5-F
A4A5R24	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A5R25	0757-0279	2	RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A5R26	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A5R27	0757-0290	3	RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFBC1/8-T0-6191-F
A4A5R28	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A5R29	0757-0276	3	RESISTOR 61.9 1% .125W F TC=0+-100	03298	C4-1/8-T0-6192-F
A4A5R30	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260

Table 9-4. A4A5 Step Gain, Replaceable Parts (3 of 3)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A5R31	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A5R32	2100-3054	3	RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	73138	89PR5K
A4A5R33	2100-3163	1	RESISTOR-TRMR 1M 20% C SIDE-ADJ 17-TRN	73138	89PR1M
A4A5R34	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A5R35	0698-3132	1	RESISTOR 261 1% .125W F TC=0+-100	03298	C4-1/8-T0-2610-F
A4A5R36	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A5R37	0757-0276		RESISTOR 61.9 1% .125W F TC=0+-100	03298	C4-1/8-T0-6192-F
A4A5R38	0757-0401	2	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A5R39	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFBC1/8-T0-6191-F
A4A5R40	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A5R41	0757-0394	2	RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A5R42	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	[illegible]	[illegible]
A4A5R43	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A5R44	2100-3054		RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	73138	89PR5K
A4A5R45	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A5R46	0757-0420	2	RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A4A5R47	0757-0276		RESISTOR 61.9 1% .125W F TC=0+-100	03298	C4-1/8-T0-6192-F
A4A5R48	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A5R49	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFBC1/8-T0-6191-F
A4A5R50	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A5R51	2100-3161	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	73138	89PR20K
A4A5R52	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	[illegible]	[illegible]
A4A5R53	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A5R54	2100-3054		RESISTOR-TRMR 5K 10% C SIDE-ADJ 17-TRN	73138	89PR5K
A4A5R55	0757-0420		RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A4A5R56	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A5R57	0757-0438	1	RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A5R58	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A5R59	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A5R60	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A5R61	0757-0403		RESISTOR 121 1% .125W F TC=0+-100	03298	C4-1/8-T0-121R-F
A4A5R62*	0698-0084	7	RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A5R63	0757-0397	1	RESISTOR 68.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-68R1-F
A4A5R64	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A5R65	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A5R66	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A5R67	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A5R68	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	[illegible]	[illegible]
A4A5R69	0757-0195	1	RESISTOR 56.2 1% .125W F TC=0+-100	03298	C4-1/8-T0-56R2-F
A4A5R70*	0757-0280	11	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A5R71	0757-0400	1	RESISTOR 90.9 1% .125W F TC=0+-100	03298	C4-1/8-T0-90R9-F
A4A5R72-A4A5R79 A4A5R80			NOT ASSIGNED		[illegible] 8-T0-1001-F
A4A5R81	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A5R82	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A5R83	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A5R84	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A5R85	0757-0316	1	RESISTOR 42.2 1% .125W F TC=0+-100	03298	C4-1/8-T0-42R2-F
A4A5R86*			*FACTORY SELECTED PART		
A4A5R87	0698-3438	1	RESISTOR 147 1% .125W F TC=0+-100	03298	C4-1/8-T0-147R-F
A4A5R88	0757-0317	1	RESISTOR 1.33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A4A5R89	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A5R90	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A5R91	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A5R92	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A5R93	0757-0180	1	RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A5R94			NOT ASSIGNED		
A4A5R95			NOT ASSIGNED		
A4A5R96	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A5R97	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A5U1	1826-0261	1	IC 741 OP AMP	28480	1826-0261
A4A5VR1	1902-3104	1	DIODE-ZNR 5.62V 5% DO-7 PD=.4W TC=+.016%	02030	BZ 10939-110
A4A5Y1	0410-0671	1	CRYSTAL, 1.4 MHZ	28480	0410-0671
			A4A5 MISCELLANEOUS PARTS		
	8670I-40001	1	EXTRACTOR, PC BOARD	28480	8670I-40001

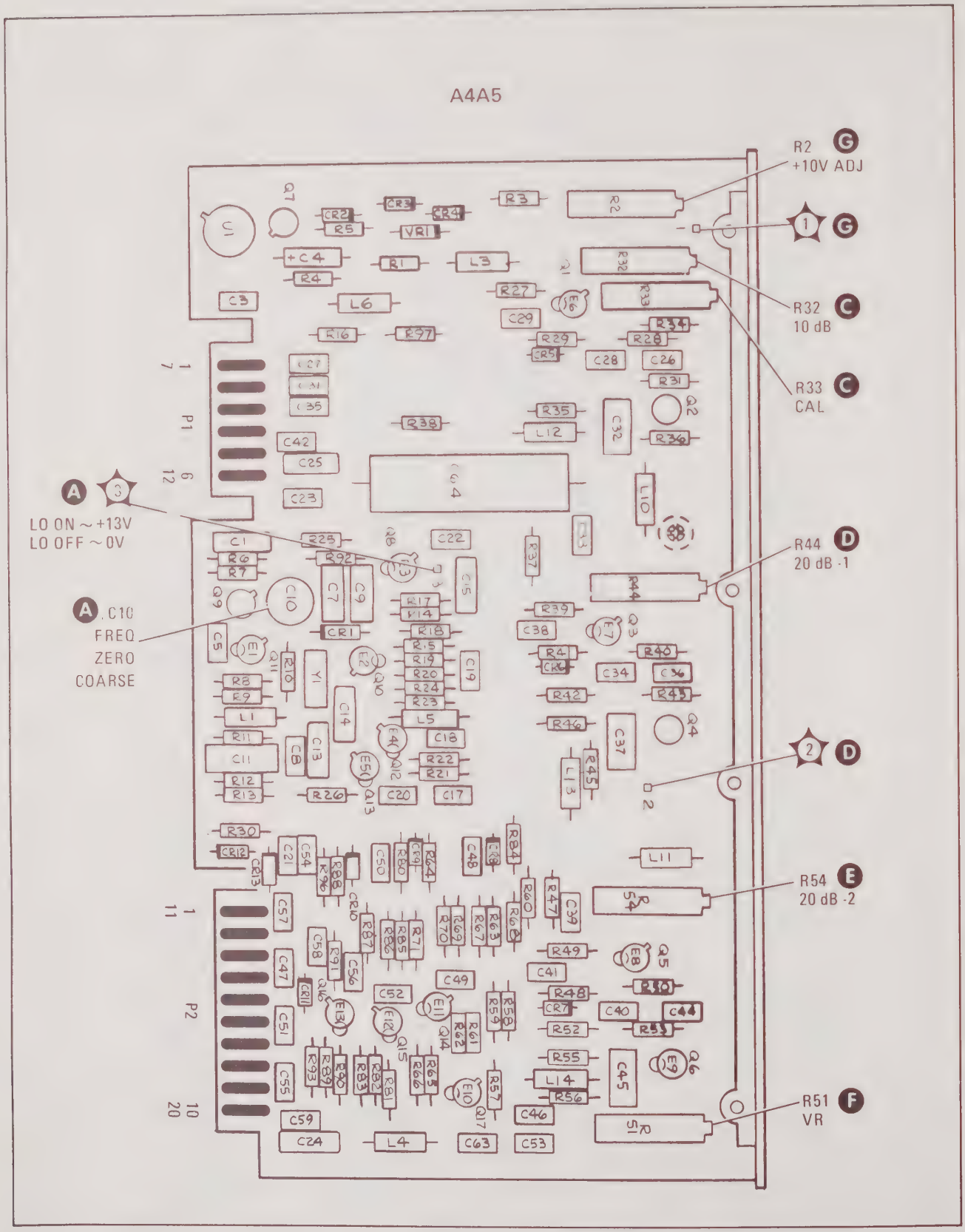


Figure 9-39. A4A5 Step Gain, Component Locations

A4A4 BANDWIDTH FILTER, CIRCUIT DESCRIPTION (Service Sheet 7)

A4A4 Bandwidth Filter determines the bandwidth of the 21.4 MHz IF in conjunction with A4A8 Attenuator — Bandwidth Filter. A4A4 is very similar to A4A8 except that it does not have a switchable gain input amplifier, and it has an extra stage of crystal filtering. Only the 10 dB Gain Input Buffer Amplifier will be described here. For descriptions of the other circuits in A4A4, refer to descriptions of the corresponding circuits in A4A8.

Input Buffer Amplifier (A)

The 10 dB Input Buffer Amplifier (Figure 9-42) functions as a non-inverting op amp.

In the crystal mode (30 kHz, 10 kHz, and 3 kHz bandwidths), the amplifier includes Q7. The biasing of the amplifier is independent of its RF (21.4 MHz) operation but is very critical for its proper functioning. If a malfunction occurs, the dc bias should be checked first.

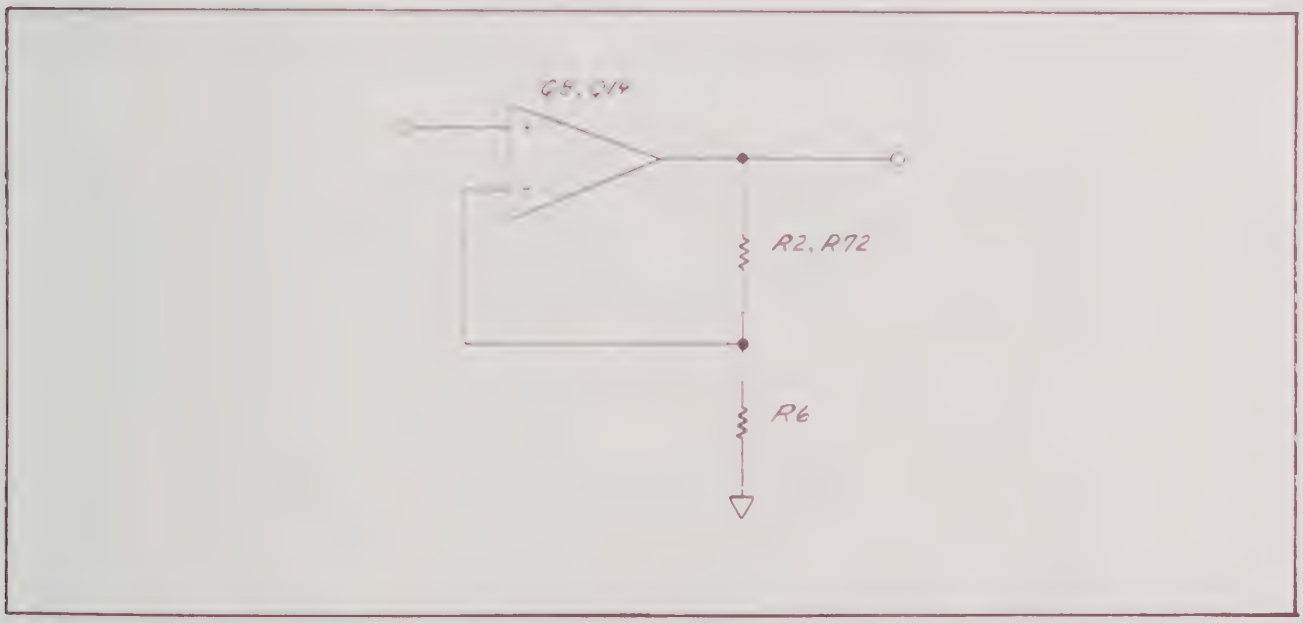


Figure 9-42. A4A4 Input Buffer Amplifier, Equivalent Circuit

The current through Q14 is determined by the difference between two current sources, one involving Q7 and the other involving Q8 (See Figure 9-43). The most convenient way to find the current from each source is to measure the voltage across each emitter resistor. (A 1 kΩ resistor should be used in series with the voltmeter probe tip to prevent the circuit from oscillating and giving an erroneous reading.) For Q7, the current through R90 must be included. If results are inconsistent, the emitter resistor should be checked also. Check to see that the BW5 line is at the voltage specified on the schematic.

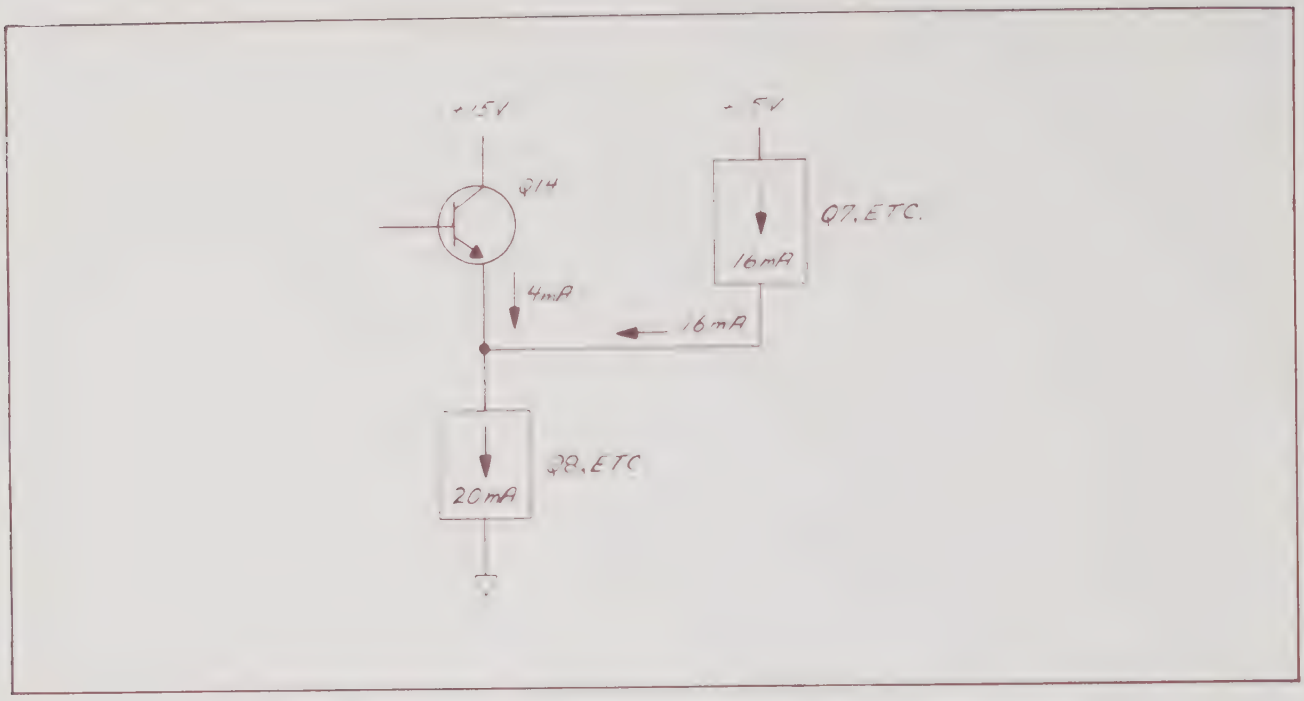


Figure 9-43. A4A4 Input Buffer Amplifier, Current Sinks

In the LC mode (the four wider bandwidths), the BW5 line goes to approximately +14.8V and turns off the current source Q7. The current supplied by Q7 in the crystal mode is now supplied through CR1 and R12 from the BW5 line. In the LC mode, the current through Q14 can be found by subtracting the current through R12 from the current through R4.

Table 9-5. A4A4 Bandwidth Filter, Replaceable Parts (1 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A4	85662-60008	1	BOARD ASSEMBLY, BANDWIDTH FILTER	28480	85662-60008
A4A4C1	0160-2055	48	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C2	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C3	0160-2254	1	CAPACITOR-FXD 7.5PF +-.25PF 500VDC	28480	0160-2254
A4A4C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C6	0160-4297	3	CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A4A4C7	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C8	0160-2257	3	CAPACITOR-FXD 10PF +-5% 500VDC CER0+-60	28480	0160-2257
A4A4C9	0121-0059	3	CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A4A4C10*	0160-2249	3	CAPACITOR-FXD 4.7PF +-.25PF 500VDC	28480	0160-2249
A4A4C11	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C13	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C15	0160-3456	2	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A4A4C16	0160-3431	2	CAPACITOR-FXD 6.8PF +-.5PF 500VDC	28480	0160-3431
A4A4C17*	0140-0194	3	CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR
A4A4C18	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C19	0121-0036	2	CAPACITOR-V TRMR-CER 5.5-18PF 350V	73899	DV11PR18A
A4A4C20	0121-0446	3	CAPACITOR-V TRMR-CER 4.5-20PF 100V	0186M	78_TRIKO-19 4.5-20 PF, N750
A4A4C21	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C22	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C23	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C24	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C25	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C26	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C27	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C28	0140-0194		CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR
A4A4C29	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C30	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C31	0160-2207	3	CAPACITOR-FXD 300PF +-5% 300VDC MICA0+70	28480	0160-2207
A4A4C32	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C33	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A4A4C34	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C35	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C36	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C37	0160-2257		CAPACITOR-FXD 10PF +-5% 500VDC CER0+-60	28480	0160-2257
A4A4C38*	0160-2249		CAPACITOR-FXD 4.7PF +-.25PF 500VDC	28480	0160-2249
A4A4C39	0121-0059		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A4A4C40	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C41	0121-0452	2	CAPACITOR-V TRMR-AIR 1.3-5.4PF 250V	74970	187-0103-005
A4A4C42			NOT ASSIGNED		
A4A4C43	0121-0452		CAPACITOR-V TRMR-AIR 1.3-5.4PF 250V	74970	187-0103-005
A4A4C44			NOT ASSIGNED		
A4A4C45			NOT ASSIGNED		
A4A4C46	0160-4084	3	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A4C47	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C48	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C49	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C50	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C51			NOT ASSIGNED		
A4A4C52	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C53	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C54	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C55	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A4A4C56	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C57	0160-2207		CAPACITOR-FXD 300PF +-5% 300VDC MICA0+70	28480	0160-2207
A4A4C58	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C59	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C60	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C61	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C62	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A4A4C63	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C64	0160-2257		CAPACITOR-FXD 10PF +-5% 500VDC CER0+-60	28480	0160-2257
A4A4C65	0121-0059		CAPACITOR-V TRMR-CER 2-8PF 350V PC-MTG	73899	DV11PR8A
A4A4C66*	0160-2249		CAPACITOR-FXD 4.7PF +-.25PF 500VDC	28480	0160-2249
A4A4C67	0121-0036		CAPACITOR-V TRMR-CER 5.5-18PF 350V	73899	DV11PR18A
A4A4C68	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C69	0160-3431		CAPACITOR-FXD 6.8PF +-.5PF 500VDC	28480	0160-3431
A4A4C70*	0140-0194		CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR

Table 9-5. A4A4 Bandwidth Filter, Replaceable Parts (2 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A4C71	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C72	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C73	0121-0446		CAPACITOR-V TRMR-CER 4.5-20PF 100V	0146M	78-TRIKO-19 4.5-20 PF, N750
A4A4C74	0121-0446		CAPACITOR-V TRMR-CER 4.5-20PF 100V	0146M	78-TRIKO-19 4.5-20 PF, N750
A4A4C75			NOT ASSIGNED		
A4A4C76	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C77	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C78	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C79	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C80	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C81	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C82			NOT ASSIGNED		
A4A4C83			NOT ASSIGNED		
A4A4C84	0160-2207		CAPACITOR-FXD 300PF +-5% 300VDC MICA 0+70	28480	0160-2207
A4A4C85			NOT ASSIGNED		
A4A4C86	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4C87	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A4C88	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A4C89	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A4CR1	1901-0047	17	DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR2			NOT ASSIGNED		
A4A4CR3	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR4	1901-1070	6	DIODE-PIN	28480	1901-1070
A4A4CR5	1901-1070		DIODE-PIN	28480	1901-1070
A4A4CR6	1901-0535		DIODE-SCHOTTKY	28480	1901-0535
A4A4CR7	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR8	1901-0535		DIODE-SCHOTTKY	28480	1901-0535
A4A4CR9			NOT ASSIGNED		
A4A4CR10	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR11			NOT ASSIGNED		
A4A4CR12	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR13	1901-1070		DIODE-PIN	28480	1901-1070
A4A4CR14	1901-0535		DIODE-SCHOTTKY	28480	1901-0535
A4A4CR15	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR16	1901-0535		DIODE	28480	[illegible]
A4A4CR17			NOT ASSIGNED		
A4A4CR18	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR19	1901-1070		DIODE-PIN	28480	1901-1070
A4A4CR20	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR21	1901-1070		DIODE-PIN	28480	1901-1070
A4A4CR22	1901-0535		DIODE-SCHOTTKY	28480	1901-0535
A4A4CR23	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR24	[illegible]		[illegible]	28480	[illegible]
A4A4CR25	1901-1070		DIODE-PIN	28480	1901-1070
A4A4CR26			NOT ASSIGNED		
A4A4CR27	1901-0535	2	DIODE-SCHOTTKY	28480	1901-0535
A4A4CR28	1901-0535		DIODE-SCHOTTKY	28480	1901-0535
A4A4CR29	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4CR30	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A4E1	9170-0029	15	CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4E2	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4E3	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4E4	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4E5	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4E6	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4E7	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4E8	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4E9	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4E10	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4E11	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4E12	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4E13	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4E14	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4E15	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A4L1	9100-1641	3	COIL-MLD 240UH 10% Q=50 .155DX.375LG	02178	15-1315-21J
A4A4L2	9140-0114	4	COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15-4445-2K
A4A4L3	9100-1620	4	COIL-MLD 15UH 10% Q=65 .155DX.375LG	02178	15-4445-4K
A4A4L4	9100-3854	2	COIL 400NH 5% Q=150 .3DX1.016LG	28480	9100-3854
A4A4L5	9140-0098	3	COIL-MLD 2.2UH 10% Q=33 .155DX.375LG	02178	15-4425-10K
A4A4L6	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	02178	15-4445-4K
A4A4L7	9100-1641		COIL-MLD 240UH 10% Q=50 [illegible]	02178	15-1315-21J
A4A4L8	9140-0098		COIL-MLD 2.2UH 10% Q=33 .155DX.375LG	02178	15-4425-10K
A4A4L9	9100-1618	7	COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15-4435-1K
A4A4L10	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15-4435-1K

Table 9-5. A4A4 Bandwidth Filter, Replaceable Parts (3 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A4L11			NOT ASSIGNED		
A4A4L12	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.4435-1K
A4A4L13	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	02178	15.4445-4K
A4A4L14	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.4435-1K
A4A4L15	9140-0118		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15.4445-2K
A4A4L16	9140-0118		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15.4445-2K
A4A4L17	9140-0118		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15.4445-2K
A4A4L18	9100-3854		COIL 400NH 5% Q=150 .3DX1.016LG	28480	9100-3854
A4A4L19	9140-0098		COIL-MLD 2.2UH 10% Q=33 .155DX.375LG	02178	15.4425-10K
A4A4L20	9100-1641			02178	1515-21
A4A4L21			NOT ASSIGNED		
A4A4L22	9100-1620		COIL-MLD 15UH 10% Q=65 .155DX.375LG	02178	15.4445-4K
A4A4L23			NOT ASSIGNED		
A4A4L24	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.4435-1K
A4A4L25	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.4435-1K
A4A4L26	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.4435-1K
A4A4Q1					
A4A4Q2	1853-0007	7	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02038	2N3251
A4A4Q3	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02038	2N3251
A4A4Q4	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02038	2N3251
A4A4Q5	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02038	2N3251
A4A4Q6	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02038	2N3251
A4A4Q7	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02038	2N3251
A4A4Q8	1854-0404	3	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A4Q9	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02038	2N3251
A4A4Q10	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A4Q11					
A4A4Q12	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A4Q13	1855-0347		TRANSISTOR N-CHANNEL JUNCTION FET	01295	SKA 6>
A4A4Q14	1854-0345	1	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	02038	2N5179
A4A4R1	0757-0441		RESISTOR 8.25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A4A4R2	0757-0180	5	RESISTOR 31.6 1% .125W F TC=0+-100		
A4A4R3			NOT ASSIGNED		
A4A4R4	0757-0401	8	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A4R5	0757-0442	8	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A4R6	0757-0397	1	RESISTOR 68.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-68R1-F
A4A4R7	0698-3155	3	RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A4R8	0757-0280	8	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A4R9	0757-0438	6	RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A4R10	0698-3441	3	RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A4A4R11	0757-0443	3	RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1102-F
A4A4R12	0698-0082	4	RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A4R13	0698-3446	3	RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A4R14	0698-3442	3	RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A4A4R15	0757-0279	3	RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A4R16*	0757-0290	8	RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFqC1/8-T0-6191-F
A4A4R17	0698-3156	4	RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A4A4R18	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A4A4R19	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A4R20*	0757-0441	8	RESISTOR 8.25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A4A4R21	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFqC1/8-T0-6191-F
A4A4R22	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFqC1/8-T0-6191-F
A4A4R23			NOT ASSIGNED		
A4A4R24	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A4R25	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A4R26	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A4R27	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A4R28	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A4R29	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1102-F
A4A4R30	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A4R31	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A4A4R32	0698-3446		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A4R33	0698-3442		RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A4A4R34	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A4R35*	0698-3132	1	RESISTOR 261 1% .125W F TC=0+-100	03298	C4-1/8-T0-2610-F
A4A4R36			NOT ASSIGNED		
A4A4R37	0757-0458	1	RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A4A4R38			NOT ASSIGNED		
A4A4R39	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A4R40*	0757-0441		RESISTOR 8.25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A4A4R41	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFqC1/8-T0-6191-F
A4A4R42	0698-3136	1	RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A4A4R43	2100-3162	1	RESISTOR-TRMR 200K 10% C SIDE-ADJ 17-TRN	73138	89PR200K
A4A4R44	0757-0465	1	RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A4R45*	0757-0346		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A4R46	0757-0280		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F

Table 9-5. A4A4 Bandwidth Filter, Replaceable Parts (4 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A4R47			NOT ASSIGNED		
A4A4R48	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFRC1/8-T0-6191-F
A4A4R49	2100-3052	1	RESISTOR-TRMR 50 20% C SIDE-ADJ 17-TRN	73138	89PR50
A4A4R50	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A4R51	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A4R52	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A4R53	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A4R54	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1102-F
A4A4R55	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A4R56	0698-3481		RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A4A4R57	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A4R58	0698-3442		RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A4A4R59	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A4R60*	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFRC1/8-T0-6191-F
A4A4R61	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A4A4R62	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A4A4R63	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A4R64*	0757-0441		RESISTOR 8.25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A4A4R65*	0757-1098	1	RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A4A4R66	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFRC1/8-T0-6191-F
A4A4R67	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFRC1/8-T0-6191-F
A4A4R68	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A4R69			NOT ASSIGNED		
A4A4R70	0698-3440	1	RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A4A4R71			NOT ASSIGNED		
A4A4R72	0698-3438	1	RESISTOR 147 1% .125W F TC=0+-100	03298	C4-1/8-T0-147R-F
A4A4R73	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A4R74	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A4R75	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A4R76	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A4R77-A4A4R81			NOT ASSIGNED		
A4A4R82	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A4R83	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A4R84	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A4R85	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A4R86			NOT ASSIGNED		
A4A4R87			NOT ASSIGNED		
A4A4R88	0698-3154	3	RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A4A4R89	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A4A4R90	0698-3154		RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A4A4R91	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A4R92	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A4R93	0757-0180		RESISTOR 31.6 1% .125W F TC=0+-100	28480	0757-0180
A4A4TP1	0360-1788	6	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SG	28480	0360-1788
A4A4TP2	0360-1788		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SG	28480	0360-1788
A4A4TP3	0360-1514	2	TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A4A4TP4	0360-1788		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SG	28480	0360-1788
A4A4TP5	0360-1788		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SG	28480	0360-1788
A4A4TP6	0360-1788		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SG	28480	0360-1788
A4A4TP7	0360-1788		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SG	28480	0360-1788
A4A4TP8	0360-1514		TERMINAL-STUD SGL-PIN PRESS-MTG	28480	0360-1514
A4A4VR1	1902-0048	1	DIODE-ZNR 6.81V 5% DO-7 PD=.4W TC=+.043%	02235	FZ7244
A4A4Y1-A4A4Y3	0410-1029	3	CRYSTAL, 21.4 MHZ (SET OF 3IX) (INCLUDES A4A8Y1=2, A4A6A1Y1)	28480	0410-1029

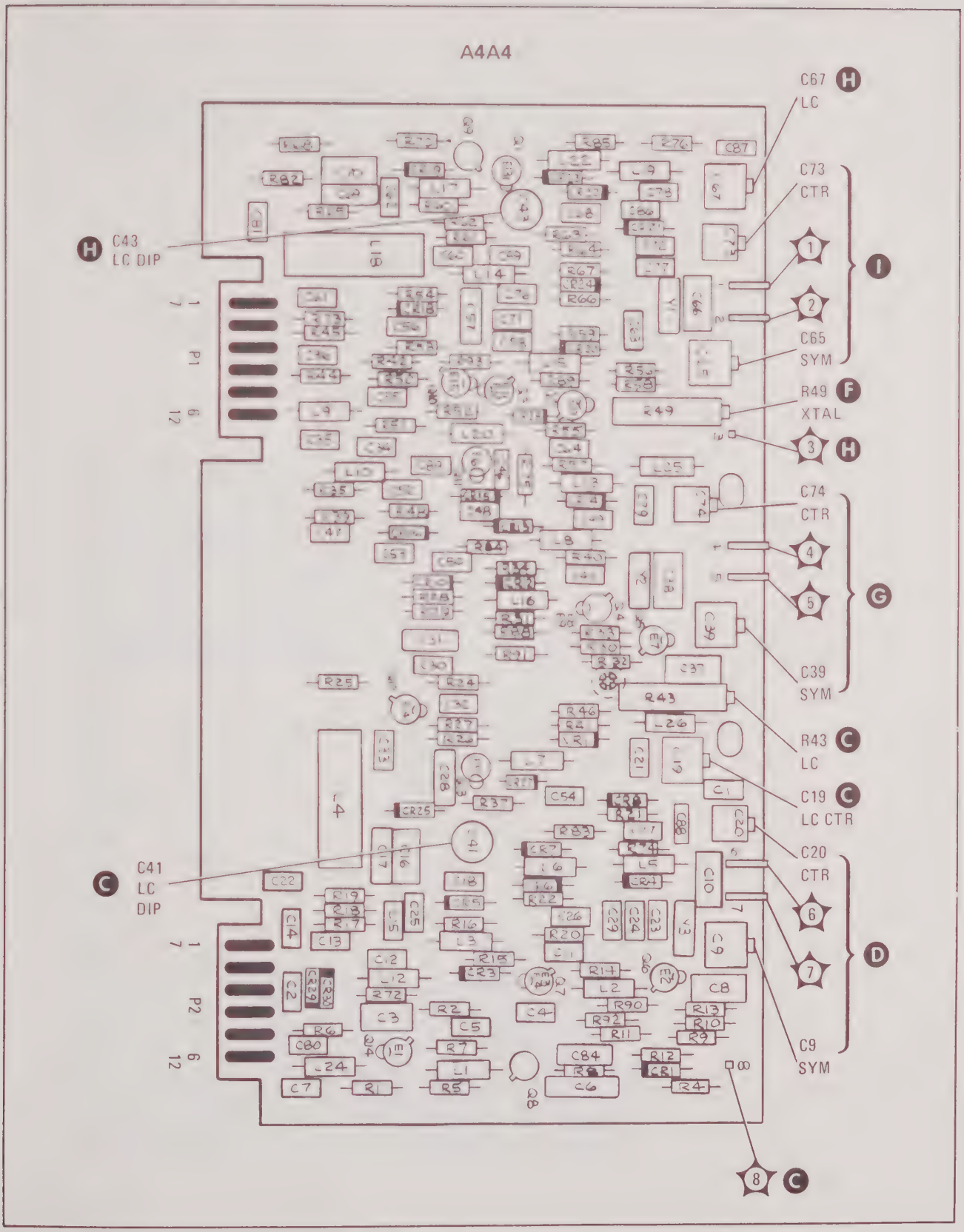


Figure 9-44. A4A4 Bandwidth Filter, Component Locations

A4A3 LOG AMPLIFIER—FILTER, CIRCUIT DESCRIPTION (Service Sheet 8)

A4A3 Log Amplifier—Filter, with A4A2 Log Amplifier—Detector, provides the ability to display signals in either a linear or log mode. In log mode the calibrated display range is 90 dB. A4A3 contains the first five of nine log stages, and A4A2 contains the last four. A4A3 also contains circuitry for using one of the log stages as a switchable 10 dB gain step. This is used only in linear mode.

After being processed by the first five log amplifier stages, the 21.4 MHz IF signal is applied to the log amplifier filter, the bandwidth of which is either narrow (approximately 1 MHz) or wide (>20 MHz). The filter is in narrow mode for resolution bandwidths of ≤30 kHz to reduce noise generated in the log amplifier stages.

Control lines from A4A9 IF Control drive circuits of A4A3 which control the log amplifier filter, log/linear switching, and 10 dB linear gain step.

Log Amplifier Stages (A)

In LOG mode, the five log amplifier stages in A4A3 and the four log amplifier stages in A4A2 limit their gain in sequence with increasing signal level to provide 90 dB of log display range. In LINEAR mode, signal-level-dependent components are switched out of the signal path, and a linear display is provided.

LOG Mode. A simplified schematic of a log amplifier stage is shown in Figure 9-47. In LOG mode, the LOG/LIN control line is high (about +7V), Q16 is on, forward biasing log diodes CR25, CR26, and all other log diodes in this assembly. CR25 and CR26 are Schottky diodes with a forward bias voltage of approximatey +0.4V. Q11 is an emitter follower used as a voltage source which drives Q12 through the resistance of CR25 and CR26. Q12 forms a common-base amplifier tuned to approximately 21.4 MHz. The gain of the amplifier is set by the ratio of R48 to the total resistance R_T between the emitters of Q11 and Q12 (primarily the resistance of CR25 and CR26). The formula for computing gain is:

$$G = 1 + \frac{316}{R_T}$$

R_T is at a minimum (approximately 150Ω) for small signals. The small-signal gain of the stage (about 10 dB) is set by the dc bias current through the log diodes. As the signal level at the Q11 emitter increases, signal current cancels bias current in the log diodes, increasing R_T The gain of the stage for large signals is reduced to nearly unity (0 dB) because R_T becomes very large. Signal current flow through R41 keeps te stage gain slightly above unity to compensate for the input loading of the following stage.

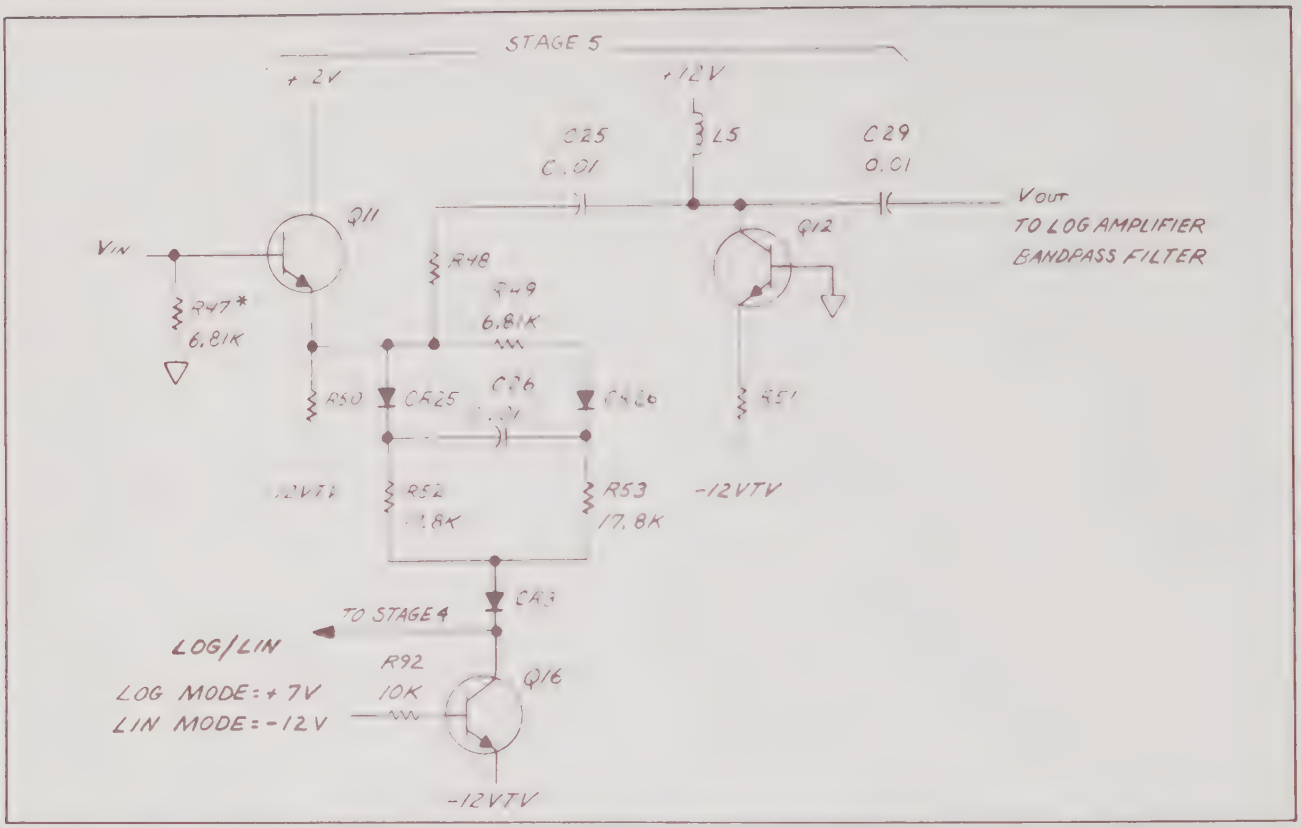


Figure 9-47. Log Amplifier Stage, Simplified Schematic

Bias Supplies

The −12 VTV is supplied to A4A3 from A4A2. This voltage determines log diode bias current and becomes more negative as temperature increases to compensate for the increased resistance of the log diodee. The same supply is used to compensate the log diodes if the four log stages in A4A2.

LINEAR Mode. (See Figure 9-47.) In LINEAR Mode, log diodes CR25 and CR26 are zero biased, and the limiting action is removed from the stage. R_1 is large, and stage gain is nearly unity. Signal flow is through emitter follower Q11 and R48 to Q13.

Log Stages. All nine of the log amplifier stages in A4A2 and A4A3 are similar in operation, although there are variations in certain stages. While all stage, except the first three contain two log diodes each, the first two stages contain six divides each, and the third contains four diodes. More diodes are used in Stages 1 through 3 because these stages have their logging action at higher signal levels than the other log stages. Log diodes of Stages 1 and 2 are biased so that the logging action occurs at signal levels of approximately 0 dBm to +10 dBm, whereas the remaining stages log at lower signal levels. To provide proper log fidelity (log amplifier output versus input curve), attenuation is required between the output of a higher level log stage and the input of a lower level log stage. Resistive divider R20, R29, and R30 attenuates the output of Stage 2, and a similar attenuator is used between Stages 3 and 4. Resistors in series with the log diodes of Stage 1 through 3 are factory-selected to compensate for variations in log diode resistance. Correct stage gain is required for proper log fidelity. Refer to the A4A3 schematic note for the method of checking the gain of Stages 1 through 5 in log mode.

10 dB Linear Gain Step. Stage 5 is used as a switchable 10 dB gain step in linear mode at low reference levels. When control line LG10 is low (−12V typical), Q17 is off and CR27 is reverse biased, preventing CR27 from being a signal path. When control line LG10 is high (more positive than −3V), the Q17 collector is saturated to the −12V TV supply, and PIN diode CR27 is forward biased. LG10 adjustment R83 sets the bias current (and thus resistance) of PIN diode CR27. The resistance of CR27 plus R54 is set so that the gain of Stage 5 will increase by 10 dB when CR27 is turned on (refer to the foregoing gain formula). Since PIN diode resistance is unaffected by signal level, Stage 5 operates as a non-limiting amplifier. This 10 dB gain step, in conjunction with a similar 20 dB gain step in A4A2, is used for the last 30 dB of step gain (lowest 30 dB of reference level) in linear mode. See the schematic note for the reference levels at which this gain step is checked.

Bandpass Filters C

In narrow resolution bandwidths, noise generated in the log amplifiers is reduced by the Bandpass Filter following Log Amplifier Stage 5. The bandwidth of this filter is switchable between wide (>20 MHz) and narrow (about 1 MHz). In resolution bandwidths of 30 kHz or less, the filter bandwidth is narrow. This reduces the log amplifier noise contribution to be 90 dB down from the reference level. In resolution bandwidths of 100 kHz and greater, the bandwidth of the filter is wide so as not to affect the shape of the wide resolution bandwidth filters. (See Figure 9-48.)

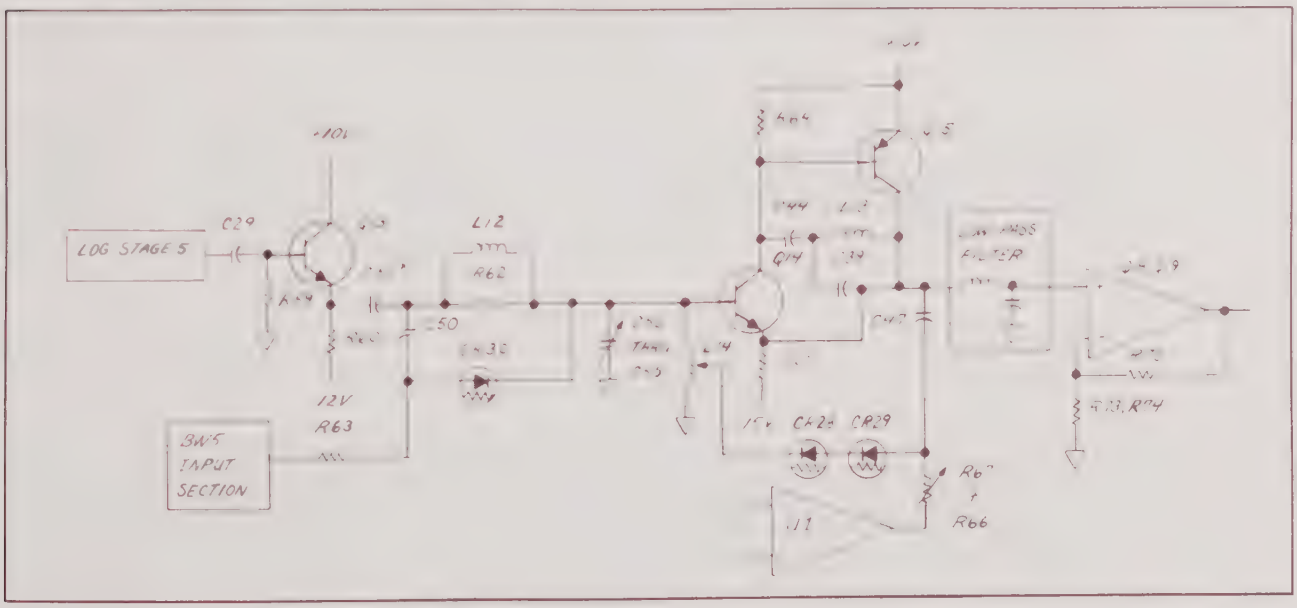


Figure 9-48. Bandpass Filter, Simplified Schematic

Bandpass Filter Switching. Emitter follower Q13 buffers the output of Log Amplifier Stage 5 and drives the Bandpass Filter. The filter bandwidth is determined by the resistance through which the LC tank network (L14 and C52 through C55) is driven. In resolution bandwidths of 3 MHz to 100 kHz, bandwidth control line BW5 is high (+15V) and CR30 is forward biased through R63, resulting in a low filter drive impedance and wide bandwidth. When the analyzer resolution bandwidth is less than 100 kHz, BW5 is low (about −0.6V). CR30 is reverse biased, and the LC shunt network is driven through R62, setting the filter bandwidth at about 1 MHz. The signal is buffered by Q14 and Q15. The output of buffer amplifier Q14/Q15 provides a low impedance drive for the Low-Pass Filter. The Buffer Amplifier Q14/Q15 also drives the center tap of L14 through the resistance of PIN diodes CR28 and CR29. This feedback results in

an apparent negative input resistance in parallel with L14. The negative input resistance compensates for the parallel resistance present in the tank circuit because of the Q of L14. The gain of the filter in narrow mode is set equal to that in wide mode by setting the resistance CR28 and CR29. The resistance of CR28 and CR29 is set by adjusting the diode bias current with AMPTD FILTER AMPL adjustment R67. L13 and C39 are frequency compensation for Q14 and Q15.

BW5 Input Section. TP7 and TP8 provide a means to adjust the bandpass filter for equal gain in wide and narrow modes. This can be done without changing IF bandwidth, which might in itself introduce an amplitude change. With the analyzer in narrow resolution bandwidths (30 kHz through 10 Hz), BW5 is approximately −0.6V, which reverse biases CR30. This places the Bandpass Filter in narrow mode. The center frequency of the bandpass filter can be adjusted with CRT adjusment C55. To place the Bandpass Filter in wide mode, TP7 and TP8 are shorted together with a jumper wire. This forward biases CR30 through R89 and R63. Filter amplitude can then be set with FILTER AMPL adjustment R67 so that amplitudes are equal in wide (test points jumpered) and narrow (jumper removed) modes.

Filter Temperature Compensation (D)

The Filter Temperature Compensation circuit stabilizes the gain of the bandpass filter with temperature changes.

Op Amp U1 and associated circuitry provide temperature dependent bias for CR28 and CR29 to compensate for temperature-dependent changes in the Q of L14 and the resistance of CR28 and CR29. As temperature increases, diode bias current increases as the voltage at U1 pin 6 increases. CR5 and CR6 operates as temperature-sensing elements to control the voltage at U1 pin 6.

Low-Pass Filter

The Low-Pass Filter consists of L15, L16, C56 through C59, R67, and R68. It has a bandwidth of about 30 MHz, which removes harmonics of the 21.4 MHz IF signal to reduce log fidelity variations between wide and narrow settings of the Bandpass Filter. The Low-Pass Filter has a loss of 6 dB, which is compensated for by buffer amplifier Q18/Q19, which has a gain of 6 dB. R74* is factory-selected to adjust the gain of Q18/Q19 for proper log fidelity.

A4A3 LOG AMPLIFIER—FILTER, TROUBLESHOOTING HINTS

If the amplitude of the displayed signals is approximately 10 dB low (i.e., CAL OUTPUT appears to be −20 dBm) in the log mode but correct in the linear display mode, then one of the log amplifier stages in the A4A3 Log Amplifier-Filter board or the A4A2 Log Amplifier-Detector board is defective. Connect a 10 dB step attenuator between the CAL OUTPUT and SIGNAL INPUT 2 connectors. Refer to the Log Amplifier Stage Gain Check note on the service sheets for the necessary front panel control settings. When forward biased in log mode the Schottky diodes should have voltage drops of 200–400 mV.

The following procedure will determine if the Linear Gain Steps, LG10 and LG20, are operating properly. The LG10 circuitry is located on the A4A3 Log Amplifier-Filter Board while the LG20 circuitry is located on the A4A2 Log Amplifier-Detector Board. Connect a 10 dB step attenuator set to 0 dB between the CAL OUTPUT and SIGNAL INPUT 2 connectors. Key in the following settings:

. . . . . 20 MHz
. . . . . 10 kHz
. . . . . 3 kHz
. . . . . 0 dB
LOG SCALE (Turns off IF Step Gains)
. . . . . −60 dBm
SCALE LIN

The peak of the displayed signal should be on the top graticule. Adjust the front panel AMPTD CAL control to place the peak of the signal one division below the top graticule. If the signal limits at the top of the display, one of the Linear Gain Steps is stuck in the on state.

Set the 10 dB step attenuator to 10 dB and key in −70 dBm. The peak of the displayed signal should be one division below the top graticule. If signal limits at the top of the display, the LG20 circuitry is defective. A signal approximately 3 divisions high indicates the LG10 circuitry is defective.

Set the 10 dB step attenuator to 20 dB and key in −80dBm. The peak of the displayed signal should be one division below the top graticule. The LG10 circuitry is defective if the signal limits at the top of the display. The LG20 circuitry is faulty if the displayed signal is approximately 3 divisions high.

The Detector circuit on the A4A2 Log Amplifier-Detector board is most easily checked with DC voltages. These are derived using 0 Hz and attenuating the CAL OUTPUT signal. The easiest point to check the Detector output without removing boards is A4A1TP1. Connect a DVM to this test point. The voltage at A4A1TP1 should be +1V for a signal displayed on the top graticule. The output will be 0.1V less for each division down from the top in either the linear or the 10 dB/Div log modes when the detector is operating properly.

Table 9-6. A4A3 Log Amplifier–Filter, Replaceable Parts (1 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A3	85662-60009	1	BOARD ASSEMBLY, LOG AMPLIFIER-FILTER	28480	85662-60009
A4A3C1	0160-2055	46	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C2	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C3	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C6	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C7	0160-2244	1	CAPACITOR-FXD 3PF +-.25PF 500VDC	28480	0160-2244
A4A3C8	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C9	0160-2236	2	CAPACITOR-FXD 1PF +-.25PF 500VDC	28480	0160-2236
A4A3C10	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C11	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C13	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C15	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C16	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C18	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C19	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C20	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C21			NOT ASSIGNED		
A4A3C22			NOT ASSIGNED		
A4A3C23	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C24	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C25	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C26	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C27	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C28	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C29	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C30			NOT ASSIGNED		
A4A3C31	0160-4297	6	CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDM
A4A3C32	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDM
A4A3C33	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C34	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C35			NOT ASSIGNED		
A4A3C36			NOT ASSIGNED		
A4A3C37	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDM
A4A3C38	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C39	0160-2255	1	CAPACITOR-FXD 8.2PF +-.25PF 500VDC	28480	0160-2255
A4A3C40	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C41	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDM
A4A3C42	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C43	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C44	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C45	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C46	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C47	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C48	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C49	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C50	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C51	0160-3534	1	CAPACITOR-FXD 510PF +-5% 100VDC MICA0+70	28480	0160-3534
A4A3C52			NOT ASSIGNED		
A4A3C53*	0140-0194	1	CAPACITOR-FXD 110PF +-5% 300VDC MICA	72136	DM15F111J0300WV1CR
A4A3C54	0160-0455	1	CAPACITOR-FXD 18PF +-2% 600VDC	28480	0160-0455
A4A3C55	0121-0493	1	CAPACITOR-V AIR DIEL 1.7-11PF 250V	74970	187-0306-105
A4A3C56	0160-2251	1	CAPACITOR-FXD 5.6PF +-.25PF 500VDC	28480	0160-2251
A4A3C57	0160-2236		CAPACITOR-FXD 1PF +-.25PF 500VDC	28480	0160-2236
A4A3C58	0160-2262	1	CAPACITOR-FXD 16PF +-5% 500VDC CER0+-30	28480	0160-2262
A4A3C59	0160-2252	1	CAPACITOR-FXD 6.2PF +-.25PF 500VDC	28480	0160-2252
A4A3C60			NOT ASSIGNED		
A4A3C61	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C62	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C63	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C64			NOT ASSIGNED		
A4A3C65	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C66	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDM
A4A3C67	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C68	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C69	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A3C70	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055

Table 9-6. A4A3 Log Amplifier–Filter, Replaceable Parts (2 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A3C71	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A4A3CR1	1901-0047	7	DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A3CR2	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A3CR3	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A3CR4	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A3CR5	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A3CR6	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A3CR7	1901-1085	20	DIODE-SCHOTTKY	28480	1901-1085
A4A3CR8	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR9	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR10	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR11	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR12	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR13	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR14	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR15	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR16	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR17	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR18	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR19	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR20	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR21	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR22	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR23	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR24	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR25	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR26	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A3CR27	1901-1070	4	DIODE-PIN	28480	1901-1070
A4A3CR28	1901-1070		DIODE-PIN	28480	1901-1070
A4A3CR29	1901-1070		DIODE-PIN	28480	1901-1070
A4A3CR30	1901-1070		DIODE-PIN	28480	1901-1070
A4A3CR31	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A3E1	9170-0029	12	CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A3E2	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A3E3	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A3E4	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A3E5	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A3E6	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A3E7	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A3E8	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A3E9	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A3E10	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A3E11	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A3E12	9170-0029		CORE-SHIELDING BEAD	0188G	56-590-65A2/4A
A4A3L1	9140-0105	6	COIL-MLD 8,2UH 10% Q=50 ,155DX,375LG	28480	9140-0105
A4A3L2	9140-0105		COIL-MLD 8,2UH 10% Q=50 ,155DX,375LG	28480	9140-0105
A4A3L3	9140-0105		COIL-MLD 8,2UH 10% Q=50 ,155DX,375LG	28480	9140-0105
A4A3L4	9140-0105		COIL-MLD 8,2UH 10% Q=50 ,155DX,375LG	28480	9140-0105
A4A3L5	9140-0105		COIL-MLD 8,2UH 10% Q=50 ,155DX,375LG	28480	9140-0105
A4A3L6	9100-1618	6	COIL-MLD 5,6UH 10% Q=45 ,155DX,375LG	02178	15-4435-1K
A4A3L7	9100-1618		COIL-MLD 5,6UH 10% Q=45 ,155DX,375LG	02178	15-4435-1K
A4A3L8	9100-1618		COIL-MLD 5,6UH 10% Q=45 ,155DX,375LG	02178	15-4435-1K
A4A3L9	9100-1618		COIL-MLD 5,6UH 10% Q=45 ,155DX,375LG	02178	15-4435-1K
A4A3L10	9100-1618		COIL-MLD 5,6UH 10% Q=45 ,155DX,375LG	02178	15-4435-1K
A4A3L11	9100-1618		COIL-MLD 5,6UH 10% Q=45 ,155DX,375LG	02178	15-4435-1K
A4A3L12	9100-1623	1	COIL-MLD 27UH 5% Q=60 ,155DX,375LG	02178	15-4455-2J
A4A3L13	9140-0105		COIL-MLD 8,2UH 10% Q=50 ,155DX,375LG	28480	9140-0105
A4A3L14	9100-3854	1	COIL 400NH 5% Q=150 ,3DX1,016LG	28480	9100-3854
A4A3L15	9140-0111	1	COIL-MLD 3,3UH 10% Q=33 ,155DX,375LG	02178	15-4425-12K
A4A3L16	9140-0098	1	COIL-MLD 2,2UH 10% Q=33 ,155DX,375LG	02178	15-4425-10K
A4A3Q1	1854-0345	1	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	02036	2N5179
A4A3Q2	1853-0007	3	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02036	2N3251
A4A3Q3	1854-0019	11	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q4	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q5	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02036	2N3251
A4A3Q6	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q7	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q8	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q9	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q10	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q11	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q12	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q13	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q14	1854-0546	1	TRANSISTOR NPN SI TO-72 PD=200MW	28480	1854-0546
A4A3Q15	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02036	2N3251

Table 9-6. A4A3 Log Amplifier–Filter, Replaceable Parts (3 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A3Q16	1854-0404	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A3Q17	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A3Q18	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A3Q19	1853-0405	1	TRANSISTOR PNP 2N4209 SI TO-18 PD=300MW	28480	1853-0405
A4A3R1			NOT ASSIGNED		
A4A3R2	0757-0346	6	RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A3R3			NOT ASSIGNED		
A4A3R4	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A3R5	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A3R6	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A3R7	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A3R8	0757-0401	1	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A3R9	0757-0439		RESISTOR 6,81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A3R10	0698-3444	7	RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A3R11	0698-3439	3	RESISTOR 178 1% .125W F TC=0+-100	03298	C4-1/8-T0-178R-F
A4A3R12	0698-3429	2	RESISTOR 19,6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A4A3R13	0757-0279	11	RESISTOR 3,16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A3R14	0757-0279		RESISTOR 3,16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A3R15*	0757-0316	1	RESISTOR 42,2 1% .125W F TC=0+-100	03298	C4-1/8-T0-42R2-F
A4A3R16	0698-0084	3	RESISTOR 2,15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A3R17	0698-3151	2	RESISTOR 2,87K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2871-F
A4A3R18			NOT ASSIGNED		
A4A3R19	0757-0439		RESISTOR 6,81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A3R20	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A3R21	0698-3429		RESISTOR 19,6 1% .125W F TC=0+-100	03888	PME55-1/8-T0-19R6-F
A4A3R22	0698-3439		RESISTOR 178 1% .125W F TC=0+-100	03298	C4-1/8-T0-178R-F
A4A3R23	0757-0274	3	RESISTOR 1,21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A4A3R24	0757-0279		RESISTOR 3,16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A3R25*	0757-0394	1	RESISTOR 51,1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A3R26	0698-3151		RESISTOR 2,87K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2871-F
A4A3R27	0698-0084		RESISTOR 2,15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A3R28			NOT ASSIGNED		
A4A3R29	0698-3440	1	RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A4A3R30	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A3R31	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A3R32	0757-0439		RESISTOR 6,81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A3R33	0757-0279		RESISTOR 3,16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A3R34	0757-0279		RESISTOR 3,16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A3R35*	0757-0180	1	RESISTOR 31,6 1% .125W F TC=0+-100		
A4A3R36	0757-0441	2	RESISTOR 8,25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A4A3R37	0757-0441		RESISTOR 8,25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A4A3R38	0698-3443	1	RESISTOR 287 1% .125W F TC=0+-100	03298	C4-1/8-T0-287R-F
A4A3R39	0698-3446	1	RESISTOR 383 1% .125W F TC=0+-100	03298	C4-1/8-T0-383R-F
A4A3R40	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A3R41	0757-0439		RESISTOR 6,81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A3R42	0757-0279		RESISTOR 3,16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A3R43	0757-0279		RESISTOR 3,16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A3R44	0698-3136	4	RESISTOR 17,8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A4A3R45	0698-3136		RESISTOR 17,8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A4A3R46			NOT ASSIGNED		
A4A3R47*	0757-0439	8	RESISTOR 6,81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A3R48	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A3R49	0757-0439		RESISTOR 6,81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A3R50	0757-0279		RESISTOR 3,16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A3R51	0757-0279		RESISTOR 3,16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A3R52	0698-3136		RESISTOR 17,8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A4A3R53	0698-3136		RESISTOR 17,8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A4A3R54*	0757-0399	1	RESISTOR 82,5 1% .125W F TC=0+-100	03298	C4-1/8-T0-82R5-F
A4A3R55			NOT ASSIGNED		
A4A3R56			NOT ASSIGNED		
A4A3R57	0757-0442	6	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A3R58			NOT ASSIGNED		
A4A3R59	0757-0439		RESISTOR 6,81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A3R60	0698-0084		RESISTOR 2,15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A3R61	0698-0082	2	RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A3R62	0757-0274		RESISTOR 1,21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A4A3R63	0757-0439		RESISTOR 6,81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A3R64	0698-3439		RESISTOR 178 1% .125W F TC=0+-100	03298	C4-1/8-T0-178R-F
A4A3R65	0757-0274		RESISTOR 1,21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A4A3R66*	0757-0462	1	RESISTOR 75K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7502-F
A4A3R67	2100-3054	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	73138	89P50K
A4A3R68	0698-0082		RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A4A3R69	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A3R70	0757-0416	1	RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F

Table 9-6. A4A3 Log Amplifier–Filter, Replaceable Parts (4 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A3R71			NOT ASSIGNED		
A4A3R72	0757-0280	3	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A3R73	0757-0418	1	RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A4A3R74*	0757-0290	1	RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A4A3R75			NOT ASSIGNED		
A4A3R76	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A3R77	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A3R78	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A3R79*	0698-3450	1	RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A4A3R80*	0757-0278	1	RESISTOR 1.78K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1781-F
A4A3R81			NOT ASSIGNED		
A4A3R82	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A3R83	2100-3161	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	73138	89P20K
A4A3R84	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A3R85	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A3R86			NOT ASSIGNED		
A4A3R87	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A3R88	0698-3160	1	RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A4A3R89	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A3R90	0757-0465	1	RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A3R91			NOT ASSIGNED		
A4A3R92	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A3R93	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A3TP1	0360-1514	11	TERMINAL-STUD SOL-PIN PRESS-MTG	28480	0360-1514
A4A3TP2	0360-1514		TERMINAL-STUD SOL-PIN PRESS-MTG	28480	0360-1514
A4A3TP3	0360-1514		TERMINAL-STUD SOL-PIN PRESS-MTG	28480	0360-1514
A4A3TP4	0360-1514		TERMINAL-STUD SOL-PIN PRESS-MTG	28480	0360-1514
A4A3TP5	0360-1514		TERMINAL-STUD SOL-PIN PRESS-MTG	28480	0360-1514
A4A3TP6	0360-1514		TERMINAL-STUD SOL-PIN PRESS-MTG	28480	0360-1514
A4A3TP7	0360-1514		TERMINAL-STUD SOL-PIN PRESS-MTG	28480	0360-1514
A4A3TP8	0360-1514		TERMINAL-STUD SOL-PIN PRESS-MTG	28480	0360-1514
A4A3TP9	0360-1514		TERMINAL-STUD SOL-PIN PRESS-MTG	28480	0360-1514
A4A3TP10	0360-1514		TERMINAL-STUD SOL-PIN PRESS-MTG	28480	0360-1514
A4A3TP11	0360-1514		TERMINAL-STUD SOL-PIN PRESS-MTG	28480	0360-1514
A4A3U1	1826-0261	1	IC 741 OP AMP	28480	1826-0261
A4A3VR1	1902-0126	1	DIODE-ZNR 6.81V 5% DO-7 PD=.4W TC=-.073%	02030	BZ 10930-14
A4A3VR2	1902-0579	1	DIODE-ZNR 5.11V 5% DO-15 PD=1W TC=-.009%	28480	1902-0579
A4A3VR3	1902-0041	1	DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	02030	BZ 10939-98

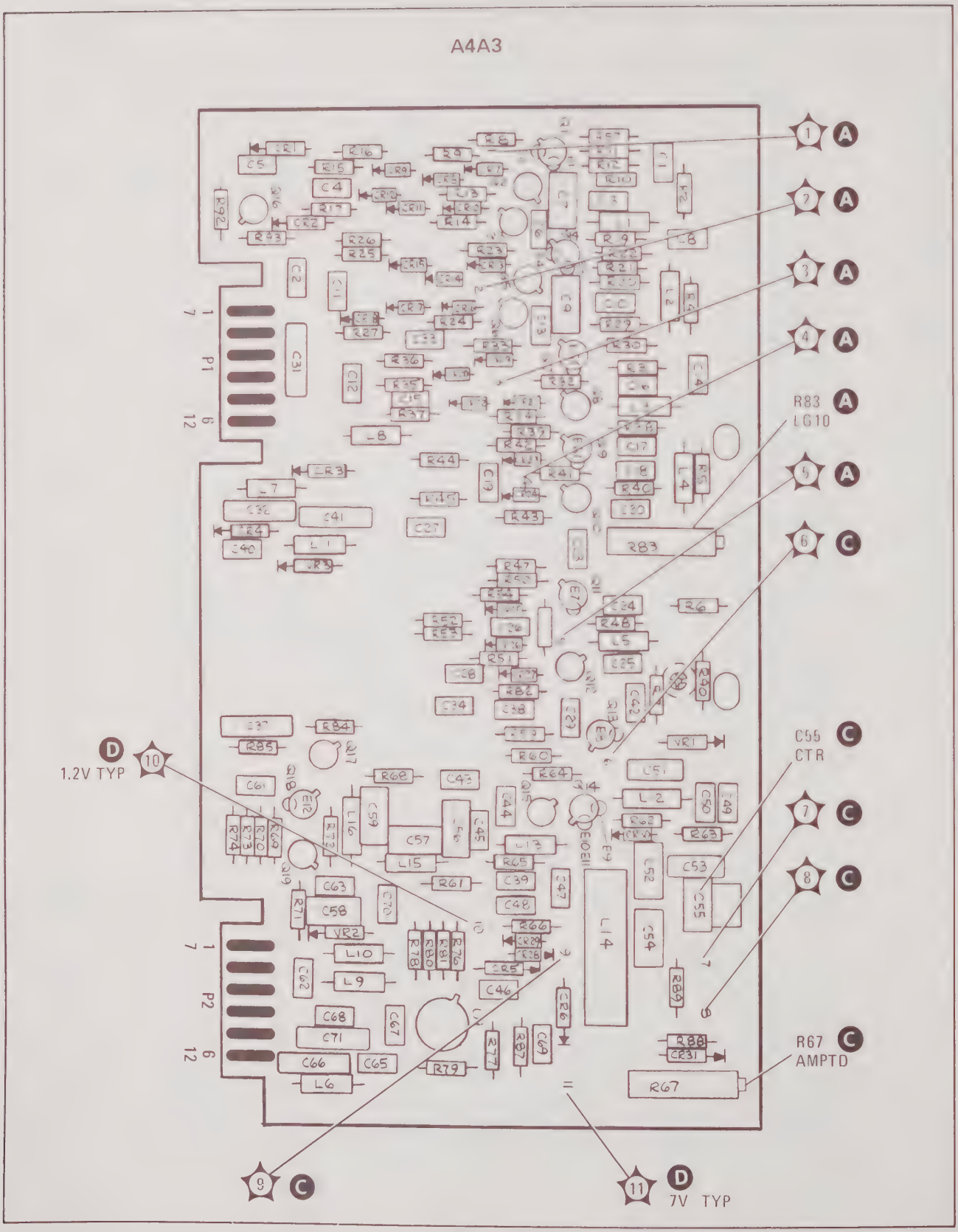


Figure 9-49. A4A3 Log Amplifier–Filter, Component Locations

A4A2 LOG AMPLIFIER—DETECTOR, CIRCUIT DESCRIPTION (Service Sheet 9)

A4A2 Log Amplifier-Detector Assembly contains the last four of the nine log amplifier stages. (The first five stages are in A4A3 Log Amplifier—Filter.) The first two stages in this assembly (Stage 6 and Stage 7) are also used in linear mode as a switchable 20 dB gain step. Following the last log stage, the 21.4 MHz IF signal is applied to a PIN diode attenuator. In log mode, this attenuation is varied with temperature to compensate for bias variations in the log stages. After passing through the PIN attenuator, the IF signal is detected to produce the vertical (video) signal which is applied to A4A1 Video Processor. The 21.4 MHz signal is attenuated and sent to the 21.4 MHz AUX OUTPUT connector on the rear panel.

The control circuit of A4A2 contains log-linear switching circuitry and 20 dB linear gain step switching circuitry. Also contained in A4A2 is a temperature dependent power supply which biases the log stages in A4A2 and A4A3. A similar temperature-dependent bias supply controls the attenuation of the PIN Diode Attenuator.

Log Amplifier Stages (A)

A4A2 contains the last four of the nine log amplifier stages. (Refer to Service Sheet 8, A4A3 Log Amplifier—Filter, for a description of log amplifier stages.) The operation of each stage is essentially identical to that of the log stages in A4A3.

LOG Mode. In LOG mode, the LOG/LIN control line from A4A9 IF Control is high (about +7V). Q9 is turned on, connecting the log diode bias resistor of each stage to the −12 VTV supply through CR16 and CR18. Q8 is off and PIN diodes CR12 and CR15 are reverse biased through R50.. The LG20 control line from A4A9 IF Control Assembly is low in LOG mode, so Q10 is off and CR6 and CR9 are reversed biased. Thus all log diodes are on, and linear gain PIN diodes are off. The logged IF signal is applied through Q14 to the PIN Diode Attenuator, the Detector, and the Counter Output Limiter.

LINEAR Mode. Each of the log stages in this assembly provides linear gain through the use of a switchable PIN diode signal path. In LINEAR mode, the LOG/LIN control line is pulled to the −12 VTV supply through R101. This turns off Q9, removing the bias current from all log diodes. As the Q9 collector is pulled high through R46, the Q8 collector saturates to the −12 VTV supply, forward biasing PIN diodes CR2 and CR15 through CR21 in Log Amplifier Stages 8 and 9. Since PIN diode resistance is not affected by signal level, Stages 8 and 9 become non-limiting amplifiers with combined gain of approximately 15 dB. R36 is factory selected to adjust the gain of Stage 9 in LINEAR mode. This gain is necessary to obtain a 1V (full screen) video output in linear mode at approximately the same input level to the IF module that causes a 1V (full screen) output in LOG mode.

20 dB Linear Gain Step . Stages 6 and 7 are used as a switchable 20 dB gain step in LINEAR mode at low reference levels. When the LG20 control line is high (more positive than −5V), The Q10 collector saturates to the −12 VTV supply, turning on PIN diodes CR6 and CR9 in Log Amplifier Stages 6 and 7. Stage 6 and 7 each provide approximately 10 dB of non-limiting gain when LG20 is high. The combined gain of stages 6 and 7 is adjusted to 20 dB by varying the resistance of CR6. R14 sets the bias current and thus the resistance of CR6.

Pin Diode Attenuator C

In LOG mode, attenuation of the PIN Diode Attenuator is varied with temperature to compensate for bias variations with temperature in the Log Amplifier Stages. The attenuation is removed in the LINEAR mode.

LOG Mode. In LOG mode, Q7 is turned off because Q8 is off. CR30 is forward biased by the LOG/LIN control line through R63. PIN diodes CR28 and CR29 are forward biased by U1B through R62 and R61. PIN diodes CR26 and CR27 operate with fixed bias current through R56 and R57. CR26 through CR29 form a resistive voltage divider with CR28 and CR29 operating as a variable resistance. Op amp U1, which biases CR28 and CR29, is a temperature dependent voltage source. The voltage at U1 pin 7 becomes more negative as temperature increases, causing the attenuation to increase. The attenuation of the PIN Diode Attenuator is set by R61. (Refer to ATTEN and —12 VTV Adjustments.)

LINEAR Mode. In LINEAR mode, Q9 is off and Q8 and Q7 are on. Q7 supplies additional drive for CR26 and CR27 through R58. This biases CR26 and CR27 so that their resistance is small (< 50Ω total). CR28 and CR29 are reverse biased through R63, since LOG/LIN is pulled to −12 VTV in linear mode. There is no attenuation, and the signal from Q14 is coupled directly to emitter follower Q5.

Detector Driver. The signal output from the PIN Diode attenuator is applied to emitter follower Q5, which provides low-impedance drive for the Detector. Bias for Q5 is supplied by R65, which with R64 forms a voltage divider for the signal from the Q5 emitter. The signal at J1 is linearly related to the displayed vertical signal in both LINEAR and LOG modes. The signal is sent by coax cable to the 21.4 MHz IF OUTPUT connector on the rear panel.

Temperature-Dependent Regulators D

The −12 VTV and PIN Diode Regulators provide temperature compensation for the Log Amplifier Stages. CR37 and CR38 operate as the temperature sensing elements to control the two voltages. U1A controls Q11 to regulate the −12 VTV supply, which provides a nominal −12V to a filter network for distribution throughout the Log Amplifier assemblies. The −12 VTV voltage is adjusted to provide proper log fidelity; it becomes more negative as temperature increases to correct for variations in log diode resistance. U1B produces a nominal −7V and forms the current source for CR28 and CR29 in the PIN Diode Attenuator. The voltage of U1B pin 7 becomes more negative as temperature increases to control the attenuation of the PIN Diode Attenuator.

ATTEN and —12 VTV Adjustments C D

The PIN Diode Attenuator adjustment (ATTEN potentiometer R61) is essentially a gain adjustment that varies the slope of the log curve. The −12 VTV adjustment (—12 VTV potentiometer R91 in the Temperature-Dependent Regulators circuit) varies the offset and slope of the log curve. These two adjustments (which interact) are used to set the output versus input curve in log mode. The IF input signal level, which causes a 1V (full screen) output in LINEAR mode, is used as a reference for full-scale deflection in LOG mode. The ATTEN and −12 VTV adjustments are made to give a 1V video output in both LOG and LINEAR modes for the same IF input signal level, and a 100 mV video output change for a 10 dB IF signal change in LOG mode.

Detector (E)

Q1 through Q4 and associated circuitry form a full wave rectifier to convert the IF signal to a video signal. Q4 is the current driver for the detector and converts voltage variations at the Q5 emitter to current variations which drive Q2 and Q3. Q3 is a half wave rectifier and conducts when the signal at the Q5 emitter is positive. The Q3 collector current is applied to the low pass filter consisting of R75, R76, L12 through L14 and C51 through C54. When the signal at the Q5 collector goes negative, current generated in the Q4 collector is pulled out of the Q2 emitter. Q1 forms a current mirror, which drives current into the low pass filter when Q2 collector current flows. Thus current flows into the low pass filter on both positive and negative halves of the IF signal at the Q5 emitter. CR31, CR32, CR33 and R72 keep Q2 and Q3 biased slightly below cutoff. When current flows into the low-pass filter from Q1 or Q3, a positive voltage is developed across R75 and R76. The voltage developed is proportional to the IF signal level at the 5 emitter. The low-pass filter has a bandwidth of about 7 MHz to remove IF frequencies from the detected video output signal. The detected voltage is applied to unity gain buffer amplifier Q12 and Q13 to drive A4A1 Video Processor. The offset of differential pair Q12 is removed by ZERO adjustment R79.

Counter Output Limiter (F)

The Counter Output Limiter provides an amplitude-limited signal at the IF frequency used for frequency counting. The IF signal from detector driver Q5 is buffered by Q6. CR35 and CR36 are biased to cutoff for signal levels above that corresponding to greater than a one-division display. In LOG or LINEAR mode, the counter output remains at approximately −30 dBm for signal levels displayed in the top nine divisions of the display.

A4A2 LOG AMPLIFIER—DETECTOR, TROUBLESHOOTING HINTS

If the amplitude of the displayed signals is approximately 10 dB low (i.e., CAL OUTPUT appears to be −20 dBm) in the log mode but correct in the linear display mode, then one of the log amplifier stages in the A4A3 Log Amplifier–Filter board or the A4A2 Log Amplifier–Detector board is defective. Connect a 10 dB step attenuator between the CAL OUTPUT and SIGNAL INPUT 2 connectors. Refer to the Log Amplifier Stage Gain Check note on the service sheets for the necessary front panel control settings. When forward biased in log mode, the Schottky diodes should have voltage drops of 200 to 400 mV.

The following procedure will determine if the Linear Gain Steps, LG10 and LG20, are operating properly. The LG10 circuitry is located on the A4A3 Log Amplifier–Filter board while the LG20 circuitry is located on the A4A2 Log Amplifier–Detector board. Connect a 10 dB step attenuator set to 0 dB between the CAL OUTPUT and SIGNAL INPUT 2 connectors. Key in the following settings:

CENTER FREQUENCY ..... 20 MHz
FREQUENCY SPAN ..... 10 kHz
RES BW ..... 3 kHz
ATTEN ..... 0 dB
SHIFT LOG SCALE (Turns off IF Step Gains)
REFERENCE LEVEL ..... −60 dBm
SCALE LIN

The peak of the displayed signal should be on the top graticule. Adjust the front panel AMPTD CAL control to place the peak of the signal one division below the top graticule. If the signal limits at the top of the display, one of the Linear Gain Steps is stuck in the on state.

Set the 10 dB step attenuator to 10 dB and key in REFERENCE LEVEL −70 dBm. The peak of the displayed signal should be one division below the top graticule. If signal limits at the top of the display, the LG20 circuitry is defective. A signal approximately 3 divisions high indicates the LG10 circuitry is defective.

Set the 10 dB step attenuator to 20 dB and key in REFERENCE LEVEL −80 dBm. The peak of the displayed signal should be one division below the top graticule. The LG10 circuitry is defective if the signal limits at the top of the display. The LG20 circuitry is faulty if the displayed signal is approximately 3 divisions high.

The detector circuit on the A4A2 Log Amplifier–Detector board is most easily checked with DC voltages. These are derived using 0 Hz SPAN and attenuating the CAL OUTPUT signal. The easiest point to check the detector output without removing boards is A4A1TP1. Connect a DVM to this test point. The voltage at A4A1TP2 should be +1V for a signal displayed on the top graticule. The output will be 0.1V less for each division down from the top in either the linear or the 10 dB/Div log modes when the detector is operating properly.

Table 9-7. A4A2 Log Amplifier–Detector, Replaceable Parts (1 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A2	85662-60010	1	BOARD ASSEMBLY, LOG AMPLIFIER-DETECTOR	28480	85662-60010
A4A2C1			NOT ASSIGNED		
A4A2C2			NOT ASSIGNED		
A4A2C3	0160-2055	50	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C5	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C6	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C7	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C8	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C10	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C11	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C13	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C15	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C16	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C18	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C19	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C20	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C21	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C22	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C23	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C24	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C25	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C26	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C27	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C28	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C29	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C30	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C31			NOT ASSIGNED		
A4A2C32	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C33	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C34	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C35			NOT ASSIGNED		
A4A2C36	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C37	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C38	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C39	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C40	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C41	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C42	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C43	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C44	0160-4084	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A4A2C45			NOT ASSIGNED		
A4A2C46	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C47			NOT ASSIGNED		
A4A2C48	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C49	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C50	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C51	0160-2262	1	CAPACITOR-FXD 16PF +-5% 500VDC CER0+-30	28480	0160-2262
A4A2C52	0160-2200	1	CAPACITOR-FXD 43PF +-5% 300VDC	28480	0160-2200
A4A2C53	0160-2307	1	CAPACITOR-FXD 47PF +-5% 300VDC	28480	0160-2307
A4A2C54	0160-2205	1	CAPACITOR-FXD 120PF +-5% 300VDC MICA0+70	28480	0160-2205
A4A2C55	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C56			NOT ASSIGNED		
A4A2C57			NOT ASSIGNED		
A4A2C58			NOT ASSIGNED		
A4A2C59	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C60			NOT ASSIGNED		
A4A2C61			NOT ASSIGNED		
A4A2C62	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C63	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C64	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C65	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C66	0180-0228	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	150D226X9015B2
A4A2C67			NOT ASSIGNED		
A4A2C68	0160-4297	7	CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A4A2C69	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A4A2C70	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH
A4A2C71	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDH

Table 9-7. A4A2 Log Amplifier–Detector, Replaceable Parts (2 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A2C72	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDM
A4A2C73	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDM
A4A2C74	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A2C75	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	0420J	C023F101M223Z822-CDM
A4A2CR1			NOT ASSIGNED		
A4A2CR2			NOT ASSIGNED		
A4A2CR3			NOT ASSIGNED		
A4A2CR4	1901-1085	8	DIODE-SCHOTTKY	28480	1901-1085
A4A2CR5	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A2CR6	1901-1070	8	DIODE-PIN	28480	1901-1070
A4A2CR7	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A2CR8	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A2CR9	1901-1070		DIODE-PIN	28480	1901-1070
A4A2CR10	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A2CR11	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A2CR12	1901-1070		DIODE-PIN	28480	1901-1070
A4A2CR13	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A2CR14	1901-1085		DIODE-SCHOTTKY	28480	1901-1085
A4A2CR15	1901-1070		DIODE-PIN	28480	1901-1070
A4A2CR16	1901-0047	10	DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR17	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR18	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR19	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR20	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR21	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR22			NOT ASSIGNED		
A4A2CR23			NOT ASSIGNED		
A4A2CR24			NOT ASSIGNED		
A4A2CR25			NOT ASSIGNED		
A4A2CR26	1901-1070		DIODE-PIN	28480	1901-1070
A4A2CR27	1901-1070		DIODE-PIN	28480	1901-1070
A4A2CR28	1901-1070		DIODE-PIN	28480	1901-1070
A4A2CR29	1901-1070		DIODE-PIN	28480	1901-1070
A4A2CR30	1901-0047		DIODE-SWITCHING 20V 75MA IONS	28480	1901-0047
A4A2CR31	1910-0016	3	DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A4A2CR32	1910-0016		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A4A2CR33	1910-0016		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A4A2CR34			NOT ASSIGNED		
A4A2CR35	1901-0047		DIODE-SWITCHING 20V 75MA IONS	28480	1901-0047
A4A2CR36	1901-0047		DIODE-SWITCHING 20V 75MA IONS	28480	1901-0047
A4A2CR37	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2CR38	1901-0047		DIODE-SWITCHING 20V 75MA 10NS	28480	1901-0047
A4A2E1	9170-0029	8	CORE-SHIELDING BEAD	01888	56-590-65A2/4A
A4A2E2	9170-0029		CORE-SHIELDING BEAD	01888	56-590-65A2/4A
A4A2E3	9170-0029		CORE-SHIELDING BEAD	01888	56-590-65A2/4A
A4A2E4	9170-0029		CORE-SHIELDING BEAD	01888	56-590-65A2/4A
A4A2E5	9170-0029		CORE-SHIELDING BEAD	01888	56-590-65A2/4A
A4A2E6	9170-0029		CORE-SHIELDING BEAD	01888	56-590-65A2/4A
A4A2E7	9170-0029		CORE-SHIELDING BEAD	01888	56-590-65A2/4A
A4A2E8	9170-0029		CORE-SHIELDING BEAD	01888	56-590-65A2/4A
A4A2J1	1250-0690	2	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A2J2	1250-0690		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A2L1	9100-1618	4	COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.4435-1K
A4A2L2	9140-0105	5	COIL-MLD 8.2UH 10% Q=50 .155DX.375LG	28480	9140-0105
A4A2L3	9140-0105		COIL-MLD 8.2UH 10% Q=50 .155DX.375LG	28480	9140-0105
A4A2L4	9140-0105		COIL-MLD 8.2UH 10% Q=50 .155DX.375LG	28480	9140-0105
A4A2L5	9140-0105		COIL-MLD 8.2UH 10% Q=50 .155DX.375LG	28480	9140-0105
A4A2L6	9100-1623	2	COIL-MLD 27UH 5% Q=60 .155DX.375LG	02178	15.4455-2J
A4A2L7	9100-1623		COIL-MLD 27UH 5% Q=60 .155DX.375LG	02178	15.4455-2J
A4A2L8	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.4435-1K
A4A2L9	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.4435-1K
A4A2L10	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.4435-1K
A4A2L11			NOT ASSIGNED		
A4A2L12	9140-0105		COIL-MLD 8.2UH 10% Q=50 .155DX.375LG	28480	9140-0105
A4A2L13	9140-0114	1	COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15.4445-2K
A4A2L14	9140-0178	1	COIL-MLD 12UH 10% Q=65 .155DX.375LG	02178	15.4445-3K
A4A2Q1	1853-0075	1	TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A4A2Q2	1854-0345	2	TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	02033	2N5179
A4A2Q3	1853-0015	1	TRANSISTOR PNP SI PD=200MW FT=500MHZ	28480	1853-0015
A4A2Q4	1854-0345		TRANSISTOR NPN 2N5179 SI TO-72 PD=200MW	02033	2N5179
A4A2Q5	1853-0405	1	TRANSISTOR PNP 2N4209 SI TO-18 PD=300MW	28480	1853-0405
A4A2Q6	1854-0019	10	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q7	1853-0281	1	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02033	2N2907A
A4A2Q8	1854-0404	4	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A2Q9	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A2Q10	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404

Table 9-7. A4A2 Log Amplifier–Detector, Replaceable Parts (3 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A2Q11	1854-0037		TRANSISTOR NPN 2N2219A SI TO-5 PD=[illegible]	[illegible]	[illegible]
A4A2Q12	1854-0475	1	TRANSISTOR=DUAL NPN PD=750MW	28480	1854-0475
A4A2Q13	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A2Q14	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q15	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q16	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q17	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q18	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q19	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q20	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q21	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2Q22	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A4A2R1	0757-0346	9	RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A2R2	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A2R3	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A2R4	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A2R5	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A2R6	0757-0279	14	RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A2R7	0757-0402		RESISTOR 110 1% .125W F TC=0+-100	03298	C4-1/8-T0-111-F
A4A2R8	0698-3136	8	RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A4A2R9	0698-3136		RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A4A2R10	0698-3444	5	RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A2R11	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A2R12	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A2R13	0757-0280	6	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A2R14	2100-3161	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	73138	89PR20K
A4A2R15	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A2R16	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A2R17	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A2R18*	0757-0402	2	RESISTOR 110 1% .125W F TC=0+-100	03298	C4-1/8-T0-111-F
A4A2R19	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A2R20	0698-3136		RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A4A2R21	0698-3136		RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A4A2R22	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A2R23	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A2R24*	0757-0439	11	RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A2R25	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A2R26	0698-3438	1	RESISTOR 147 1% .125W F TC=0+-100	03298	C4-1/8-T0-147R-F
A4A2R27	0698-3136		RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A4A2R28	0698-3136		RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A4A2R29	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A2R30	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A2R31	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A2R32	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A2R33			NOT ASSIGNED		
A4A2R34	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A2R35	0757-1094	1	RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A4A2R36*	0757-0405	1	RESISTOR 162 1% .125W F TC=0+-100	03298	C4-1/8-T0-162R-F
A4A2R37	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A2R38	0698-3136		RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A4A2R39	0698-3136		RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A4A2R40	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A2R41	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A2R42	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A2R43	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A2R44	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A2R45	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A2R46	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A2R47	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A2R48	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A2R49	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A2R50	0757-0442	14	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A2R51			NOT ASSIGNED		
A4A2R52			NOT ASSIGNED		
A4A2R53			NOT ASSIGNED		
A4A2R54			NOT ASSIGNED		
A4A2R55			NOT ASSIGNED		
A4A2R56	0757-0438	1	RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A2R57	0757-0458	2	RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A4A2R58	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A2R59	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A2R60	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A2R61	2100-1972	1	RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	03740	3005P-1-203
A4A2R62*	0698-3449	1	RESISTOR 28.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2872-F
A4A2R63	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A2R64	0757-0394	2	RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A2R65	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F

Table 9-7. A4A2 Log Amplfiier–Detector, Replaceable Parts (4 of 4)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A2R66	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A2R67	0757-0416	3	RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A2R68			NOT ASSIGNED		
A4A2R69	0698-3437	1	RESISTOR 133 1% .125W F TC=0+-100	03298	C4-1/8-T0-133R-F
A4A2R70	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A2R71	0698-3446	1	RESISTOR 383 1% .125W F TC=0+-100	03298	C4-1/8-T0-383R-F
A4A2R72	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A2R73	0757-0401	4	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A2R74	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A2R75	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A2R76	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A2R77	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A2R78	0757-0444	1	RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A4A2R79	2100-3103	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	73138	89PR10K
A4A2R80	0757-0440	1	RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A4A2R81	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A2R82	0698-3442	1	RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A4A2R83	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A2R84	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A4A2R85	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A2R86	0698-3155	1	RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A2R87	0698-3152	1	RESISTOR 3.48K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3481-F
A4A2R88*	0698-3158	1	RESISTOR 23.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2372-F
A4A2R89*	0698-3454	1	RESISTOR 215K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2153-F
A4A2R90	0757-0458		RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A4A2R91	2100-2852	1	RESISTOR-TRMR 1K 10% WW SIDE-ADJ 20-TRN	0374D	3009P-1-102
A4A2R92	0698-3154	1	RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A4A2R93	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A2R94	0683-0275	1	RESISTOR 2.7 5% .25W FC TC=-400/+500	28480	0683-0275
A4A2R95	0698-3153	2	RESISTOR 3.83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A4A2R96*	0698-3161	1	RESISTOR 38.3K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3832-F
A4A2R97*	0698-3260	1	RESISTOR 464K 1% .125W F TC=0+-100	28480	0698-3260
A4A2R98	0698-3153		RESISTOR 3.83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A4A2R99*	0757-0462	1	RESISTOR 75K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7502-F
A4A2R100	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A2R101	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A2R102	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A2R103	0757-0465	1	RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A2R104	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A2R105	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A2R106	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A2R107	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A2R108	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A2R109	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A2R110	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A2R111	0757-0123	1	RESISTOR 34.0K 1% .125W F TC=0+-100	28480	0757-0123
A4A2R112	0757-0395	1	RESISTOR 56.2 1% .125W F TC=0+-100	03298	C4-1/8-T0-56R2-F
A4A2R113	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A2R114	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A4A2R115	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A2TP1	1251-0600	8	CONTACT-CONV V/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A4A2TP2	1251-0600		CONTACT-CONV V/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A4A2TP3	1251-0600		CONTACT-CONV V/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A4A2TP4	1251-0600		CONTACT-CONV V/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A4A2TP5	1251-0600		CONTACT-CONV V/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A4A2TP6	1251-0600		CONTACT-CONV V/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A4A2TP7	1251-0600		CONTACT-CONV V/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A4A2TP8	1251-0600		CONTACT-CONV V/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A4A2U1	1826-0092	1	IC OP AMP	28480	1826-0092
A4A2VR1	1902-0126	2	DIODE-ZNR 2.61V 5% DO-7 PD=.4W TC=-.073%	02038	BZ 10939-14
A4A2VR2	1902-0041	1	DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	02038	BZ 10939-98
A4A2VR3	1902-0126		DIODE-ZNR 2.61V 5% DO-7 PD=.4W TC=-.073%	02038	BZ 10939-14

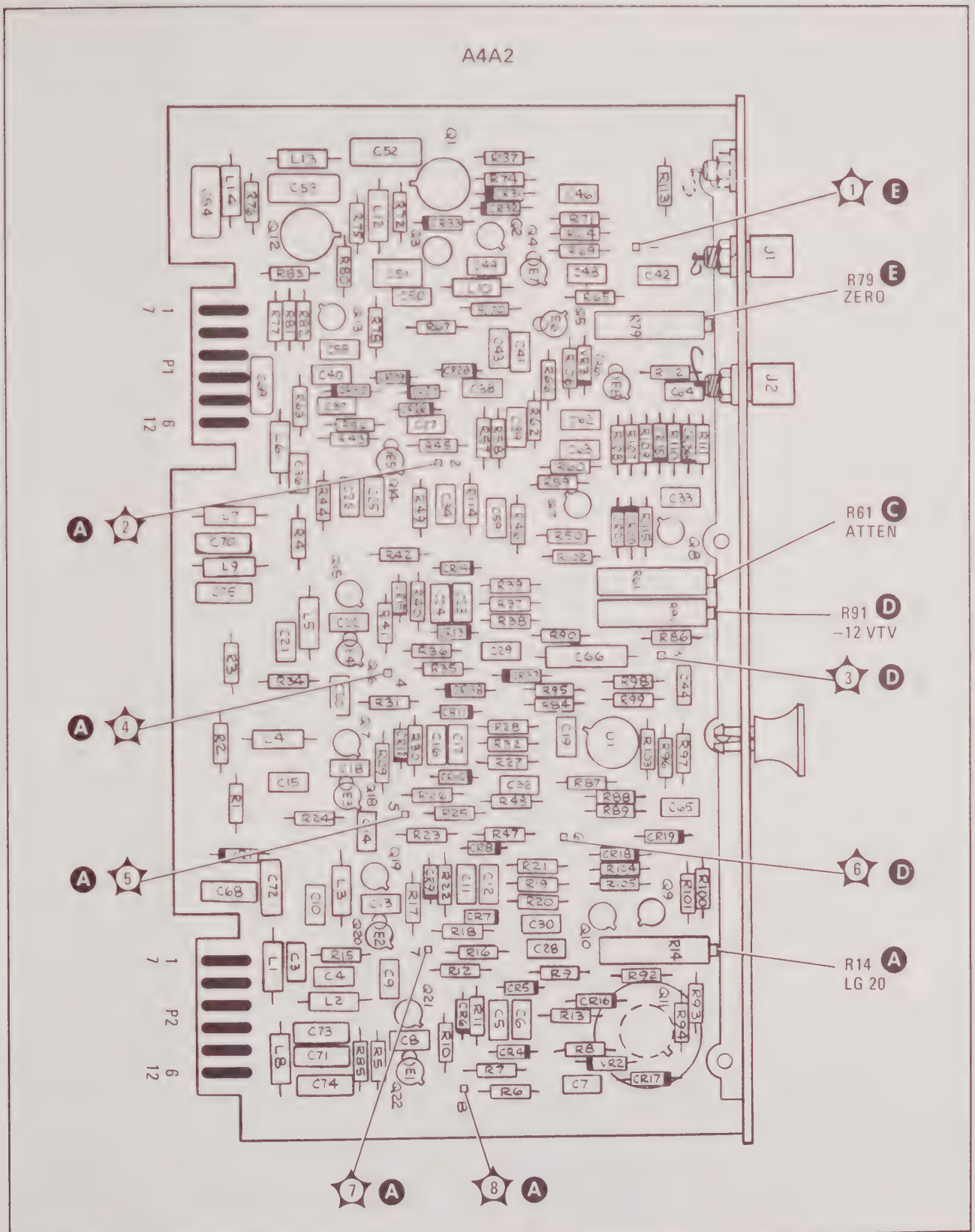


Figure 9-52. A4A2 Log Amplifier–Detector, Component Locations

A4A1 VIDEO PROCESSOR, CIRCUIT DESCRIPTION (Service Sheet 10)

A4A1 Video Processor filters the detected IF signal from A4A2 Log Amplifier, it sets the dB/DIV LOG SCALE and the REFERENCE LEVEL offsets below −50 dBm or −70 dBm, and it provides the IF video output and the X and Y recorder outputs.

Video Filter C

The Video Filter is an RC low pass filter with selectable R and C. The series resistance R is one of two values controlled by switch U7. When the switch is closed (0), R17 is short circuited and the series resistance is minimum. In this state, video bandwidths from 3 kHz to 3 MHz are attainable. (The 3 MHz nominal bandwidth is attained when Q14 through Q20 are turned off.) When switch U7 is open (1), the series resistance R is high, approximately equal to R17 and video bandwidths from 1 Hz to 1 kHz are attainable. Shunt capacitors C5 through C11 are selected by switching transistors Q14 through Q20. Only one of these switching transistors can be on at any one time. Each capacitor except C11 is used with the high series resistance for the lower bandwidths and the low series resistance for the higher bandwidths.

Log Expand D

The Log Expand circuit allows four different amplitude scales: 10, 5, 2, 1 dB/DIV. Changes in the amplitude scale are accomplished by first amplifying the video signal, then attenuating it various amounts. This is accomplished by FET input amplifier U2, which offsets the input −5V and whose gain (set by R22 and R21) is 5. The offset is set by the current through Q1. This current source is adjustable using OS potentiometer R14. Switching transistors Q4, Q5, and Q6 are turned on or off to achieve voltage divider ratios of 1/10, 1/5, 1/2, and 1. Diodes CR2 and CR3 clamp this attenuated signal at about −1.2V to prevent forward biasing any switch in the off state. A final amplifier consisting of Q7, Q8 and Q9 amplifies this attenuated signal by 4 and offsets the output +2V. A +2V output corresponds to a full scale signal. This final amplifier is a two-stage amplifier. The first stage is a FET input stage made up of dual FET Q7. The first-stage output is multiplied by the transistor inverter Q8, whose output is buffered by an emitter follower Q9. This output is fed back to the inverting input through a resistor divider stick. Gain of the amplifier is adjusted by ZERO potentiometer R32, and offset for full scale is adjusted by FS potentiometer R36. Diode CR1 clamps the output at about −1.2V.

Log Offset Current Source A

The Log Offset Current Source simulates log gain for instrument reference levels below −60 dBm. This is achieved by offsetting the 0V to 1V video input signal by driving current through the source resistance R16. This current is changed by supplying different currents into the emitter of Q13, the transistor current source. Currents are controlled by switching transistors Q10, Q11, and Q12. For example, when switch Q12 is turned on, the transistor saturates and a current flows through R5 into the emitter of Q13. This

emitter current (set by the voltage drop across R5) is closely equal to the collector current through Q12. The voltage drop across R5 can be changed by varying LG OS potentiometer R2, since U6 pin 3 and the emitter of Q13 are at the same voltage. This is true because U3 is a voltage follower with unity gain. Once R2 is set, the accuracy of R5, R7, and R9 determines the relative accuracy of the offsets, 0.1V, 0.2V, 0.2V (10 dB, 20 dB, 20 dB).

Power Supplies (F)

In the Voltage Reference circuit, zener diode VR1 is used to provide +8.8V and −10.0V sources. Amplifier U1B inverts and amplifies +8.8V to get −10.00V, which is used in the Log Expand circuit with the FS adjustment R36. The +8.8V source is used for LG OS (log offset) adjustment R2 and OS (offset) adjustment R14.

Decode Logic (B)

The Decode Logic circuit performs additional decoding on output lines from IF Control A4A9. VBWA, VBWB, VBWC, and VBWD are decoded by U8, a 1-of-8 decoder, and inverted by U10 to drive one of the seven capacitors used in the Video Filter. U11 decodes A LOG and B LOG and drives the switches that vary the attenuator in the Log Expand circuit.

Recorder Output (F)

The Recorder Output circuit provides outputs for an X-Y plotter. Also provided are outputs for calibrating lower left (LL) and upper right (UR). Calibration outputs and signal outputs are routed through switch U4. A control line, REC CAL, from IF Control A4A9 controls the state of the U4 switches. When REC CAL is high, the video output through U3 and AUX SWEEP have closed paths through the switch to provide VIDEO and SWEEP outputs to the rear panel. When the REC CAL is high, a closed path through the switch exists between the calibration voltages and the VIDEO and SWEEP outputs. Control line REC ZERO causes the FS or ZERO voltage to appear across the R50, R55, R51 divider stick. When in LL, REC ZERO is low and the switch inputs are pulled to about 0V. When REC ZERO is high, its open collector output will be set to the voltage determined by the divider stick: +10V for X_r out, and +1V for Y_r out.

A4A1 VIDEO PROCESSOR, TROUBLESHOOTING HINTS

Proper operation of the Log Offsets, OS10, OS20-1 and OS20-2 can be determined from the display.

Connect an HP 355D Step Attenuator between CAL OUTPUT and SIGNAL INPUT 2. Set this attenuator to 110 dB. Key in the following settings:

INSTR PRESET

CENTER FREQUENCY ..... 20 MHz

FREQUENCY SPAN ..... 0 Hz

RES BW ..... 3 kHz

VIDEO BW ..... 10 Hz

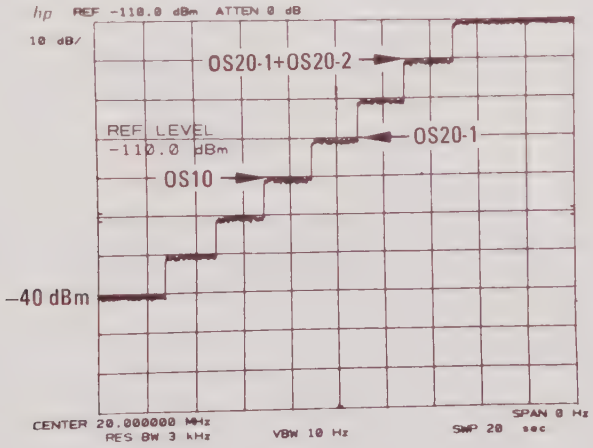
ATTEN ..... 0 dB

SHIFT ATTEN

SWEEP TIME ..... 20 Sec

REFERENCE LEVEL ..... −40 dBm

Press the SINGLE sweep key. Then press the DATA STEP ⇩ key repetitively. A display similar to figure below should result. If a step is missing, one of the offsets or its control circuitry is defective. The truth table in Note 3 is an aid to determine which offset circuit isn't operating properly. 0V in the table indictes that an offset is active. Accurate determination of amplitude step size is attainable using the MARKER Δ key and the DATA knob.



The Video Filter circuit can be checked from the front panel. With no input signal, set the controls as follows:

INSTR PRESET

CENTER FREQUENCY ..... 25 MHz

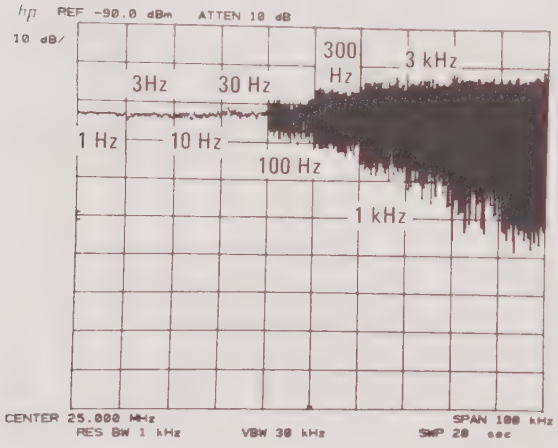
FREQUENCY SPAN ..... 100 kHz

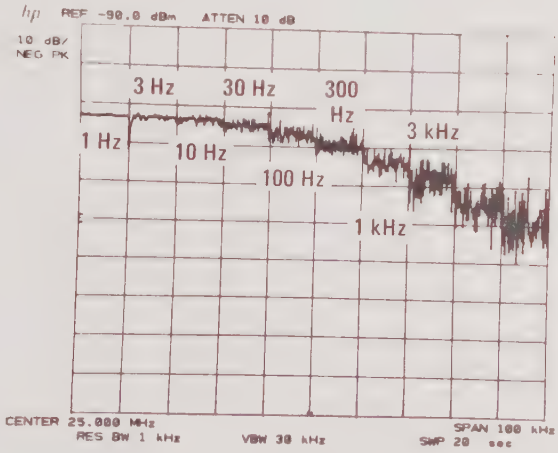
SWEEP TIME ..... 20 sec

REFERENCE LEVEL ..... −90 dBm

VIDEO BW ..... 1 Hz

Press SINGLE sweep. Then press the DATA STEP ⇧ key repetitively. The display should appear as in the following figure on the left. Now key in SHIFT TRACE A VIEW . This turns only the Negative Peak Detector on. Reset VIDEO BW to 1 Hz. Press the SINGLE sweep key. Then press the DATA step ⇧ key repetitively. The display should appear as in the following figure on the right.





If the displayed noise does not change monotonically with the step key, the indicated Video bandwidth is faulty. Refer to the service sheet to determine the defective switch, capacitor, or decoder.

The Log Expand and Decode Logic circuitry can be accurately checked by using the Error Correction Routine. Pressing SHIFT FREQUENCY SPAN (KSW) starts this routine. The error terms are displayed by pressing SHIFT LINE (KSw). The last three lines give the offset errors from the 1 dB LOG reference for the 2 dB, 5 dB and 10 dB LOG scales, respectively. Maximum error is ±0.5 dB for proper operation.

Table 9-8. A4A1 Video Processor, Replaceable Parts (1 of 2)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A1	85662-60011	1	BOARD ASSEMBLY, VIDEO PROCESSOR	28480	85662-60011
A4A1C1	0180-0197	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4A1C2	0160-2055	9	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C3	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4A1C4	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C5	0160-0945	1	CAPACITOR-FXD 910PF +-5% 100VDC MICA 0+70	28480	0160-0945
A4A1C6	0160-0155	1	CAPACITOR-FXD 3300PF +-10% 200VDC POLYE	0420J	292P33292
A4A1C7	0160-0161	1	CAPACITOR-FXD .01UF +-10% 200VDC POLYE	0420J	292P10392
A4A1C8	0160-0163	1	CAPACITOR-FXD .033UF +-10% 200VDC POLYE	0420J	292P33392
A4A1C9	0160-0168	1	CAPACITOR-FXD .1UF +-10% 200VDC POLYE	0420J	292P10492
A4A1C10	0180-2205	1	CAPACITOR-FXD .33UF+-10% 35VDC TA	0420J	150D334X9035A2
A4A1C11	0180-0291	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	0420J	150D105X9035A2
A4A1C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C13			NOT ASSIGNED		
A4A1C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C15	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C16	0180-0228	2	CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	150D226X9015B2
A4A1C17	0180-0229	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	0420J	150D336X9010B2
A4A1C18	0180-0228		CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	150D226X9015B2
A4A1C19	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C20	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C21	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C22	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A1C23	0160-2202	1	CAPACITOR-FXD 75PF +-5% 300VDC	28480	0160-2202
A4A1CR1	1901-0535	1	DIODE-SCHOTTKY	28480	1901-0535
A4A1CR2	1901-0179	2	DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A4A1CR3	1901-0179		DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A4A1J1	1250-0690	4	CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A1J2	1250-0690		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A1J3	1250-0690		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A1J4	1250-0690		CONNECTOR-RF SMB M SGL-HOLE-FR 50-OHM	28480	1250-0690
A4A1L1	9140-0114	2	COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15.444S-2K
A4A1L2	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15.444S-2K
A4A1L3	9100-1618	3	COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.443S-1K
A4A1L4	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.443S-1K
A4A1L5	9100-1618		COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.443S-1K
A4A1Q1	1853-0281	5	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02038	2N2907A
A4A1Q2	1854-0404	12	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q3	1855-0050	1	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0050
A4A1Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q7	1855-0213	1	TRANSISTOR-JFET DUAL 2N5912 N-CHAN	28480	1855-0213
A4A1Q8	1853-0316	1	TRANSISTOR-DUAL PNP PD=500MW	28480	1853-0316
A4A1Q9	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q10	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02038	2N2907A
A4A1Q11	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02038	2N2907A
A4A1Q12	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02038	2N2907A
A4A1Q13	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02038	2N2907A
A4A1Q14	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q15	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q16	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q17	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q18	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q19	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1Q20	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A1R1	0698-3155	9	RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A1R2	2100-3109	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN	73138	89PR2K
A4A1R3	0698-3151	1	RESISTOR 2.87K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2871-F
A4A1R4	0757-0442	6	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A1R5	0698-6880	1	RESISTOR 16K .5% .125W F TC=0+-50	28480	0698-6880
A4A1R6	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A1R7	0698-6755	2	RESISTOR 8K .5% .125W F TC=0+-50	03298	NC4-1/8-T2-8001-D
A4A1R8	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A1R9	0698-6755		RESISTOR 8K .5% .125W F TC=0+-50	03298	NC4-1/8-T2-8001-D
A4A1R10	0757-0290	2	RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A4A1R11	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A1R12	0757-0418	1	RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A4A1R13	0757-0280	2	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A1R14	2100-3123	1	RESISTOR-TRMR 500 10% C SIDE-ADJ 17-TRN	73138	89PR500
A4A1R15	0698-0084	7	RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F

Table 9-8. A4A1 Video Processor, Replaceable Parts (2 of 2)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A1R16	0757-0394	2	RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A1R17	0698-3452	1	RESISTOR 147K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1473-F
A4A1R18	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A1R19	0698-3158	5	RESISTOR 23.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2372-F
A4A1R20	0698-3158		RESISTOR 23.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2372-F
A4A1R21	0698-3240	2	RESISTOR 500 .25% .125W F TC=0+-50	28480	0698-3240
A4A1R22	0698-7799	3	RESISTOR 2K .25% .125W F TC=0+-100	0299E	MFQC1/8-T0-2001-C
A4A1R23	0698-7799		RESISTOR 2K .25% .125W F TC=0+-100	0299E	MFQC1/8-T0-2001-C
A4A1R24	0698-7839	1	RESISTOR 222 .5% .125W F TC=0+-50	0299E	MFQC1/8-T2-222R-D
A4A1R25	0698-3240		RESISTOR 500 .25% .125W F TC=0+-50	28480	0698-3240
A4A1R26	0698-7799		RESISTOR 2K .25% .125W F TC=0+-100	0299E	MFQC1/8-T0-2001-C
A4A1R27	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A1R28	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A1R29	0757-0200	1	RESISTOR 5.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5621-F
A4A1R30	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A1R31	0698-3444	1	RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A1R32	2100-3122	1	RESISTOR-TRMR 100 10% C TOP-ADJ 15-TRN	73138	89PR100
A4A1R33	0698-3150	1	RESISTOR 2.37K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2371-F
A4A1R34	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A1R35	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A1R36	2100-3154	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 17-TRN	73138	89PR1K
A4A1R37	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A1R38	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A1R39	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A1R40	0698-0085	2	RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A1R41	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A1R42	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MFQC1/8-T0-6191-F
A4A1R43	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A1R44	0698-3158		RESISTOR 23.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2372-F
A4A1R45	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A1R46	0698-3158		RESISTOR 23.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2372-F
A4A1R47	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A1R48	0698-3158		RESISTOR 23.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2372-F
A4A1R49	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A1R50	0698-5577	1	RESISTOR 2.5K .5% .125W F TC=0+-100	03298	C4-1/8-T0-2501-D
A4A1R51	0757-0416	2	RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A1R52	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A1R53	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A1R54	0698-3445	1	RESISTOR 348 1% .125W F TC=0+-100	03298	C4-1/8-T0-348R-F
A4A1R55	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A4A1R56	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A4A1R57	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A1R58	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A4A1TP1	1251-0600	3	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A4A1TP2	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A4A1TP3	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A4A1U1	1826-0092	1	IC OP AMP	28480	1826-0092
A4A1U2	1826-0089	1	IC 2525 OP AMP	03791	HA2-2525-5
A4A1U3	1826-0021	1	IC OP AMP	0340F	LM310H
A4A1U4	1826-0417	1	IC SWITCH	0340F	NF13333D
A4A1U5	1810-0215	1	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0374D	4308R-101-7538
A4A1U6	1826-0261	1	IC 741 OP AMP	28480	1826-0261
A4A1U7	1826-0154	1	IC SW CMOS 2-CHAN ANAL	0288C	DG200BA
A4A1U8	1820-1216	1	IC DCDR TTL LS 3-TO-8-LINE 3-INP	03790	SN74LS138N
A4A1U9	1810-0231	1	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R2.2K
A4A1U10	1820-1200	1	IC INV TTL LS HEX 1-INP	0169M	SN74LS05N
A4A1U11	1820-1272	1	IC BFR TTL LS NOR QUAD 2-INP	0169M	SN74LS33N
A4A1VR1	1902-0686	1	DIODE-ZNR 1N825 6.2V 2% DO-7 PD=.4W	02039	1N825
			A4A1 MISCELLANEOUS PARTS		
	86701-40001	1	EXTRACTOR: PC BOARD	28480	86701-40001

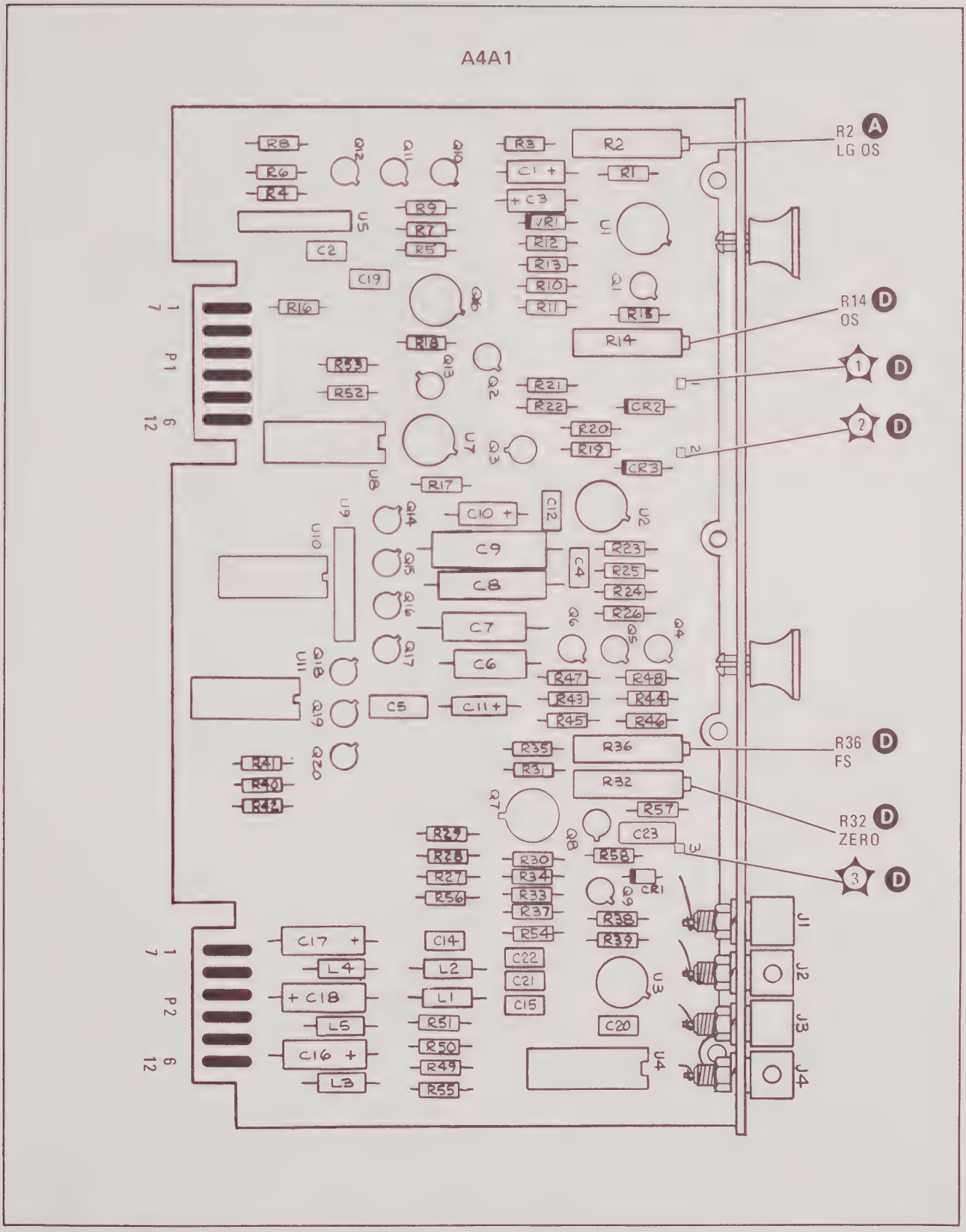


Figure 9-55. A4A1 Video Processor, Component Locations

A4A9 IF CONTROL, CIRCUIT DESCRIPTION (Service Sheet 11)

Control information for A4 IF Video assembly is transmitted over the Instrument Bus from the system controller and decoded by A4A9 IF Control.

Address Decoder (B)

The Address Decoder monitors ADR 0 - 4 and activates the input latches for addresses 20 and 21 when LTIO goes low. Address 20 activates U6, U8, and U9. Address 21 activates U3, U10, and U12:

	ADR 4 (16)	ADR 3 (8)	ADR 2 (4)	ADR 1 (2)	ADR 0 (1)
Address 20	H	L	H	L	L
Address 21	H	L	H	L	H

Input Latches (A)

The input latches hold whatever was present at their inputs when LTIO goes low. The output goes high to activate the function. For example, when U8 pin 5 is high, SG10 (step gain 10) is activated.

A0.0 to A15.9 dB Control (C)

Fourteen dB (A8dB, A4dB, and A2dB) of attenuation is accomplished by switching in discrete steps of attenuation in A4A5 Step Gain. The smaller steps (0.1 dB through 1.9 dB) are accomplished by sinking discrete amounts of current through a PIN diode attenuator in A4A5. The output of U13 goes low when a particular step of attenuation is required. The fixed resistors tied to edge connector pin P2-7 determine the amount of current sunk (and hence the attenuation) of the PIN diode attenuator. The operation of the attenuator is described in A4A5.

IF Gain Control (D)

The IF Gain Conrol interfaces with A4A5 Step Gain, the Log Amplifiers in A4A2 and A4A3, and A4A1 Video Processor. A table on the A4A9 schematic describes the conditions under which the steps are used.

Bandwidth Control (E)

Bandwidths from 3 MHz to 100 kHz (BW5 ≥ + 14.8V). These bandwidths are produced in the 21.4 MHz IF by four parallel tank circuits (two in A4A4 Bandwidth Filter and two on A4A8 Attenuator—Bandwidth Filter). Their Q (which determines bandwidth) is controlled by PIN diodes used as variable resistors. The resistance of these PIN diodes is determined by the average current through them, which is generated by Q11. Either R60, R61, or R62 is switched in by U2, depending on which bandwidth had been

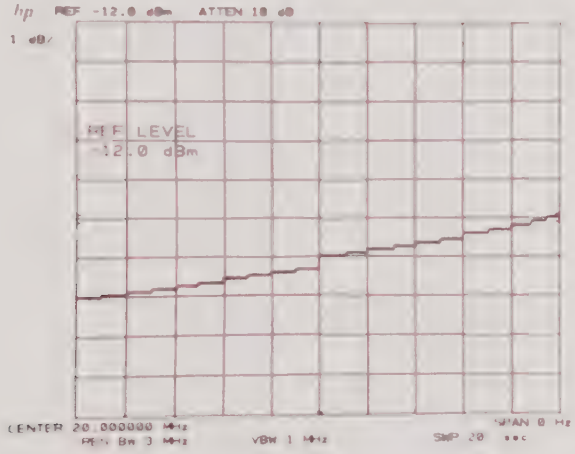
selected. These potentiometers (3 MHz, 1 MHz, and 300 kHz) determine the amount of current sunk by Q11, which in turn determines the bandwidth. If no current is sunk by Q11, the filters go to their highest Q (determined by factory-selected resistors), which yields the 100 kHz bandwidth.

Bandwidths from 30 kHz to 3 kHz (BW = —0.6V). These bandwidths are produced in the 21.4 Mhz IF by five crystal filters (two in A4A8 and three in A4A4). Their Q (which determines bandwidth) is controlled by PIN diodes, the same as for the wider bandwidths. (Refer to the preceding discussion of the wider bandwidths.) Q12 is the current sink for bandwidths from 30 kHz to 3 kHz. The amount of current it sinks is selected by U2 and adjusted by potentiometers R65 and R66 (10 kHz and 3 kHz), depending on which bandwidth is selected. If no current is sunk by Q12, the filters go to their lowest Q (determined by factory-selected resistors), which yields the 30 kHz bandwidth. Q2 should be off except for the 3 MHz to 100 kHz bandwidths.

Bandwidths from 1 kHz to 10 Hz (SWITCH = 0V). These bandwidths are produced in the 3 MHz IF (A4A7) by five crystal filters. The Q of these filters is controlled by resistors which are switched in by diodes. These, in turn, are controlled by Q27, Q28, Y30, and Q31. The transistors switch lnes which are named after the bandwidths they produce. Q29 is on (saturated) only for bandwidths 1 kHz through 10 Hz.

If the BW5 control line is not switching, Q7 is probably defective. If Q7 is found to be defective, check Q8 to determine if it has failed also.

The figure below is reproduced from the troubleshooting hints for the A4A5 Step Gain board. It shows the results of an easy test of the operation of the 0.0 to 1.9 dB attenuator section of the A0.0 to A15.9 dB control. From the figure, it can be noted that the 0.1 dB steps seem to be more accurate from −11 dBm to −12 dBm than from −10 dBm to −11 dBm. The truth table in Note 10 indicates that only the A1 dB control line is different in these ranges. When R24 is switched in, the impedance level of the circuit changes. Consequently the step size is affected. As long as the steps are discrete and monotonic during the test, the circuit is working properly.



If every other step was inaccurate during the 1 dB step test of the A0.0 — A15.9 dB Attenuator on the A4A5 Step Gain board, then R24 is an improper value. Refer to Section V for the procedure to determine the correct value.

Table 9-9. A4A9 IF Control, Replaceable Parts (1 of 2)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A9	A5662-60002	1	BOARD ASSEMBLY, IF CONTROL	28480	A5662-60002
A4A9C1	0180-0197	5	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4A9C2	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4A9C3	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4A9C4	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4A9C5	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A4A9C6	0160-2055	1	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A4A9CR1	1901-0040	12	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A9CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A9CR3			NOT ASSIGNED		
A4A9CR4			NOT ASSIGNED		
A4A9CR5					
A4A9CR6					
A4A9CR7	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A9CR8			NOT ASSIGNED		
A4A9CR9			NOT ASSIGNED		
A4A9CR10			NOT ASSIGNED		
A4A9CR11	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A9CR12	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A9CR13	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A9CR14	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A9CR15	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A9CR16	1910-0016	2	DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A4A9CR17	1910-0016		DIODE-GE 60V 60MA 1US DO-7	28480	1910-0016
A4A9CR18	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A9CR19	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A9CR20	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A4A9L1	9100-1618	1	COIL-MLD 5.6UH 10% Q=45 .155DX.375LG	02178	15.4435-1K
A4A9Q1	1854-0404	23	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q2	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q3	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q5	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q7	1853-0281	8	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02038	2N2907
A4A9Q8	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q9	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q10	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q11	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q12	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q13	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q14	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q15	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q16	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q17	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q18	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q19	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q20	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q21	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q22	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02038	2N2907A
A4A9Q23	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02038	2N2907A
A4A9Q24	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q25	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q26	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A4A9Q27	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02038	2N2907A
A4A9Q28	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02038	2N2907A
A4A9Q29	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02038	2N2907A
A4A9Q30	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02038	2N2907A
A4A9Q31	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02038	2N2907A
A4A9R1	0698-0085	17	RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R2	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R3	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R4	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R5	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R6	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R7	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R8	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R9	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R10	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R11	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R12	0757-0442	9	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A9R13	0757-0280	4	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A9R14	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A9R15	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F

Table 9-9. A4A9 IF Control, Replaceable Parts (2 of 2)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A9R16	0757-0317	1	RESISTOR 1.33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A4A9R17	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A9R18	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A9R19	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A9R20	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A9R21	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A9R22	0698-3260	4	RESISTOR 464K 1% .125W F TC=0+-100	01607	CC
A4A9R23	0698-3458	2	RESISTOR 215K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2153-F
A4A9R24*	0698-3160	1	RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A4A9R25	0698-3458		RESISTOR 215K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2153-F
A4A9R26	0757-0464	1	RESISTOR 90.9K 1% .125W F TC=0+-100	03298	C4-1/8-T0-9092-F
A4A9R27	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A4A9R28	0757-0458	1	RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A4A9R29	0757-0420	1	RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A4A9R30	0757-0438	12	RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A9R31	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A9R32	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A9R33	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A9R34	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A9R35	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A9R36	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A9R37	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R38	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R39	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R40	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A9R41	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A9R42	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A9R43	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R44	0757-0488	1	RESISTOR 1.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A4A9R45	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A9R46	0757-0819	2	RESISTOR 681 1% .125W F TC=0+-100	03298	C4-1/8-T0-681R-F
A4A9R47	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A9R48	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A9R49	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	01607	CC
A4A9R50	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	01607	CC
A4A9R51	0757-0416	2	RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A9R52	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A4A9R53	0757-0279	3	RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A9R54	0698-3260		RESISTOR 464K 1% .125W F TC=0+-100	01607	CC
A4A9R55	0698-3444	1	RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A4A9R56	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A9R57	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A4A9R58	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R59	0698-0085		RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A4A9R60	2100-3109	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 17-TRN	73138	89PR2K
A4A9R61	2100-3103	1	RESISTOR-TRMR 10K 10% C SIDE-ADJ 17-TRN	73138	89PR10K
A4A9R62	2100-3054	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 17-TRN	73138	89PR50K
A4A9R63	0757-0419		RESISTOR 681 1% .125W F TC=0+-100	03298	C4-1/8-T0-681R-F
A4A9R64	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A4A9R65	2100-3094	1	RESISTOR-TRMR 100K 10% C SIDE-ADJ 17-TRN	73138	89PR100K
A4A9R66	2100-3161	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	73138	89PR20K
A4A9R67	0757-0465	1	RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A4A9R68	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A4A9TP1	1251-0600	2	[illegible]	28480	1251-0600
A4A9TP2	1251-0600		[illegible]	28480	1251-0600
A4A9U1	1826-0092	1	IC OP AMP	28480	1826-0092
A4A9U2	1820-1418	2	IC DCDR TTL LS BCD-TO-DEC 4-TO-10-LINE	0169M	SN74LS42N
A4A9U3	1820-1195	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS175A
A4A9U4	1820-1418		IC DCDR TTL LS BCD-TO-DEC 4-TO-10-LINE	0169M	SN74LS42N
A4A9U5	1820-1199	1	IC INV TTL LS HEX 1-INP	0169M	SN74LS04N
A4A9U6	1820-1196	5	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS174N
A4A9U7	1820-1216	1	IC DCDR TTL LS 3-TO-8-LINE 3-INP	0379D	SN74LS138N
A4A9U8	1820-1196		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS174N
A4A9U9	1820-1196		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS174N
A4A9U10	1820-1196		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS174N
A4A9U11	1820-1208	1	IC GATE TTL LS OR QUAD 2-INP	0291J	74LS32A
A4A9U12	1820-1196		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS174N
A4A9U13	1820-1200	1	IC INV TTL LS HEX 1-INP	0169M	SN74LS05N
A4A9VR1	1902-0061	1	DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	02030	BZ 10939-98
A4A9VR2	1902-3203	1	DIODE-ZNR 14.7V 5% PD=.4W	[illegible]	FZ7206

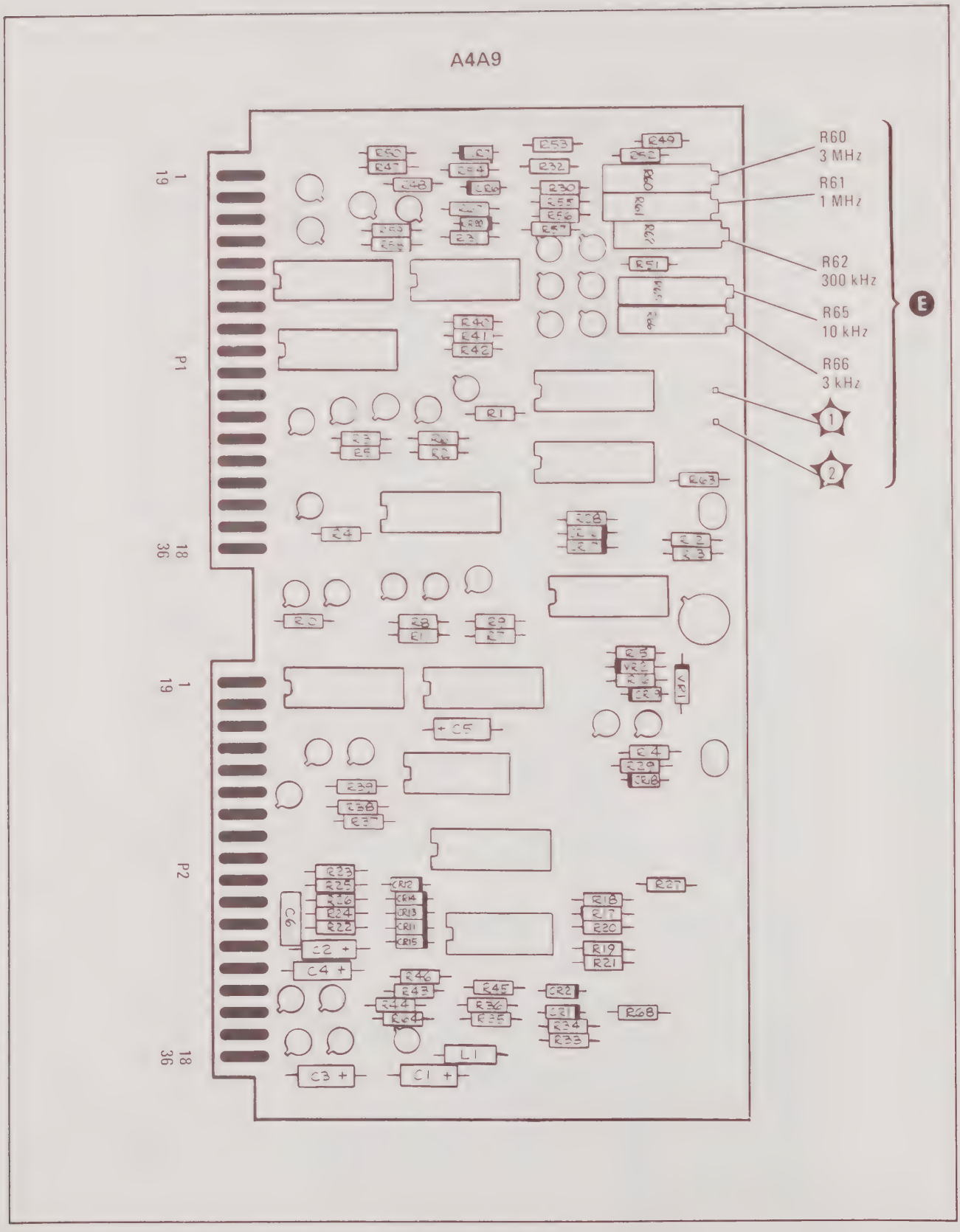


Figure 9-58. A4A9 IF Control, Component Locations

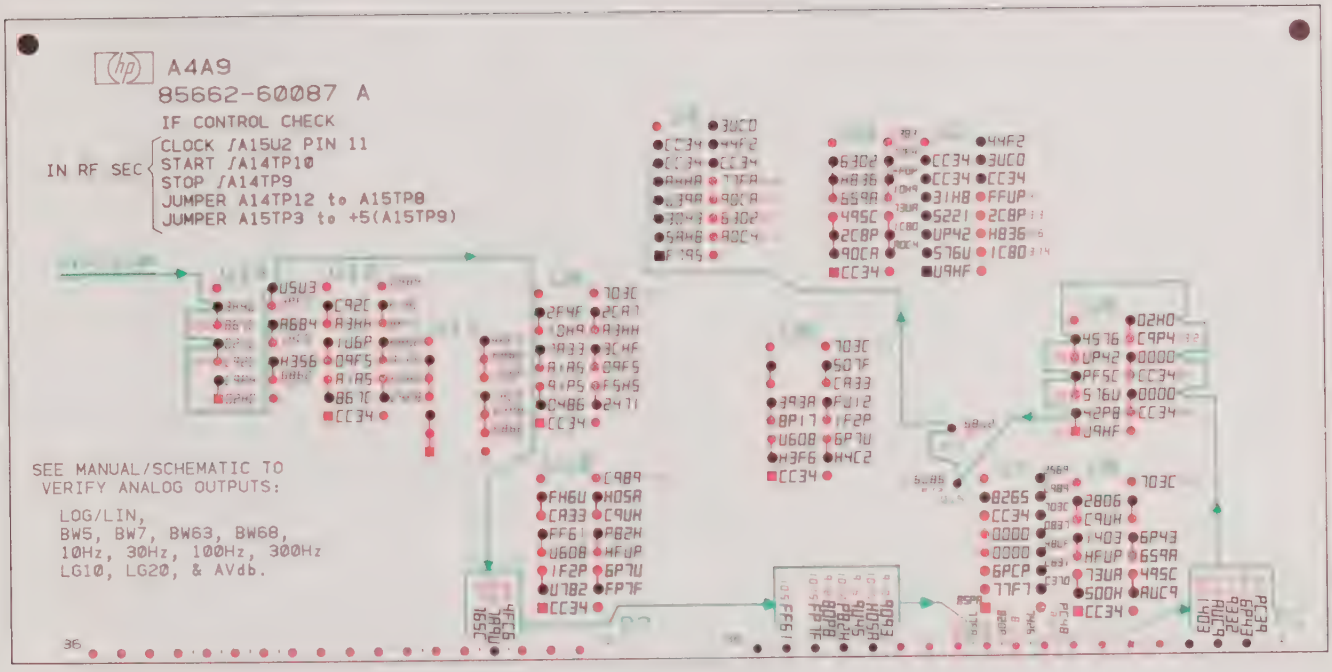


Figure 9-59. A4A9 IF Control, Signature Analysis Troubleshooting Diagram

Table 9-10. A4A10 IF-Video Motherboard, Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A4A10	85662-60020	1	BOARD ASSEMBLY, IF-VIDEO MOTHER BOARD	28480	85662-60020
A4A10C1	0180-1746	2	CAPACITOR-FXD 15UF+-10% 20VDC TA	04713	150D156X9020B2
A4A10C2	0180-0229	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	04713	150D336X9010B2
A4A10C3	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	04713	150D156X9020B2
A4A10C4	0160-4297	15	CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10C5	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10C6	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10C7	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10C8	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10C9	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10C10	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10C11	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10C12	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10C13	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10C14	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10C15	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10C16	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10C17	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10C18	0160-4297		CAPACITOR-FXD .022UF +80-20% 100VDC CER	04713	C023F101M223Z822-CDM
A4A10J1	1251-4828	1	CONNECTOR 50-PIN M POST TYPE	01389	2-87230-5
A4A10J2	1251-3276	1	CONNECTOR 6-PIN M POST TYPE	27264	09-50-1061
A4A10L1	9100-1618	11	COIL-MLD 5.6UH 10% Q=45 .159DX.375LG	02114	15-443S-1K
A4A10L2	9100-1618		COIL-MLD 5.6UH 10% Q=45 .159DX.375LG	02114	15-443S-1K
A4A10L3	9100-1618		COIL-MLD 5.6UH 10% Q=45 .159DX.375LG	02114	15-443S-1K
A4A10L4	08558-80011	3	FILTER, COIL, BLUE	28480	08558-80011
A4A10L5	08558-80011		FILTER, COIL, BLUE	28480	08558-80011
A4A10L6	08558-80011		FILTER, COIL, BLUE	28480	08558-80011
A4A10L7	9100-1618		COIL-MLD 5.6UH 10% Q=45 .159DX.375LG	02114	15-443S-1K
A4A10L8	9100-1618		COIL-MLD 5.6UH 10% Q=45 .159DX.375LG	02114	15-443S-1K
A4A10L9	9100-1618		COIL-MLD 5.6UH 10% Q=45 .159DX.375LG	02114	15-443S-1K
A4A10L10	9100-1618		COIL-MLD 5.6UH 10% Q=45 .159DX.375LG	02114	15-443S-1K
A4A10L11	9100-1618		COIL-MLD 5.6UH 10% Q=45 .159DX.375LG	02114	15-443S-1K
A4A10L12	9100-1618		COIL-MLD 5.6UH 10% Q=45 .159DX.375LG	02114	15-443S-1K
A4A10L13	9100-1618		COIL-MLD 5.6UH 10% Q=45 .159DX.375LG	02114	15-443S-1K
A4A10L14	9100-1618		COIL-MLD 5.6UH 10% Q=45 .159DX.375LG	02114	15-443S-1K
A4A10R1	0757-0401	4	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A10R2	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A10R3	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4A10R4	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A4XA1P1	1251-0472	15	CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300
A4XA1P2	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300
A4XA2P1	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300
A4XA2P2	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300
A4XA3P1	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300
A4XA3P2	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300
A4XA4P1	1251-2034	1	CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	04509	252-10-30-300
A4XA4P1	1251-2026	2	CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04509	252-18-30-300
A4XA4P2	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04509	252-18-30-300
A4XA4P1	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300
A4XA4P2	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300
A4XA5P1	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300
A4XA6P1	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300
A4XA6P2	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300
A4XA7P1	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300
A4XA7P2	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300
A4XA8P1	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300
A4XA8P2	1251-0472		CONNECTOR-PC EDGE 6-CONT/ROW 2-ROWS	04509	252-06-30-300

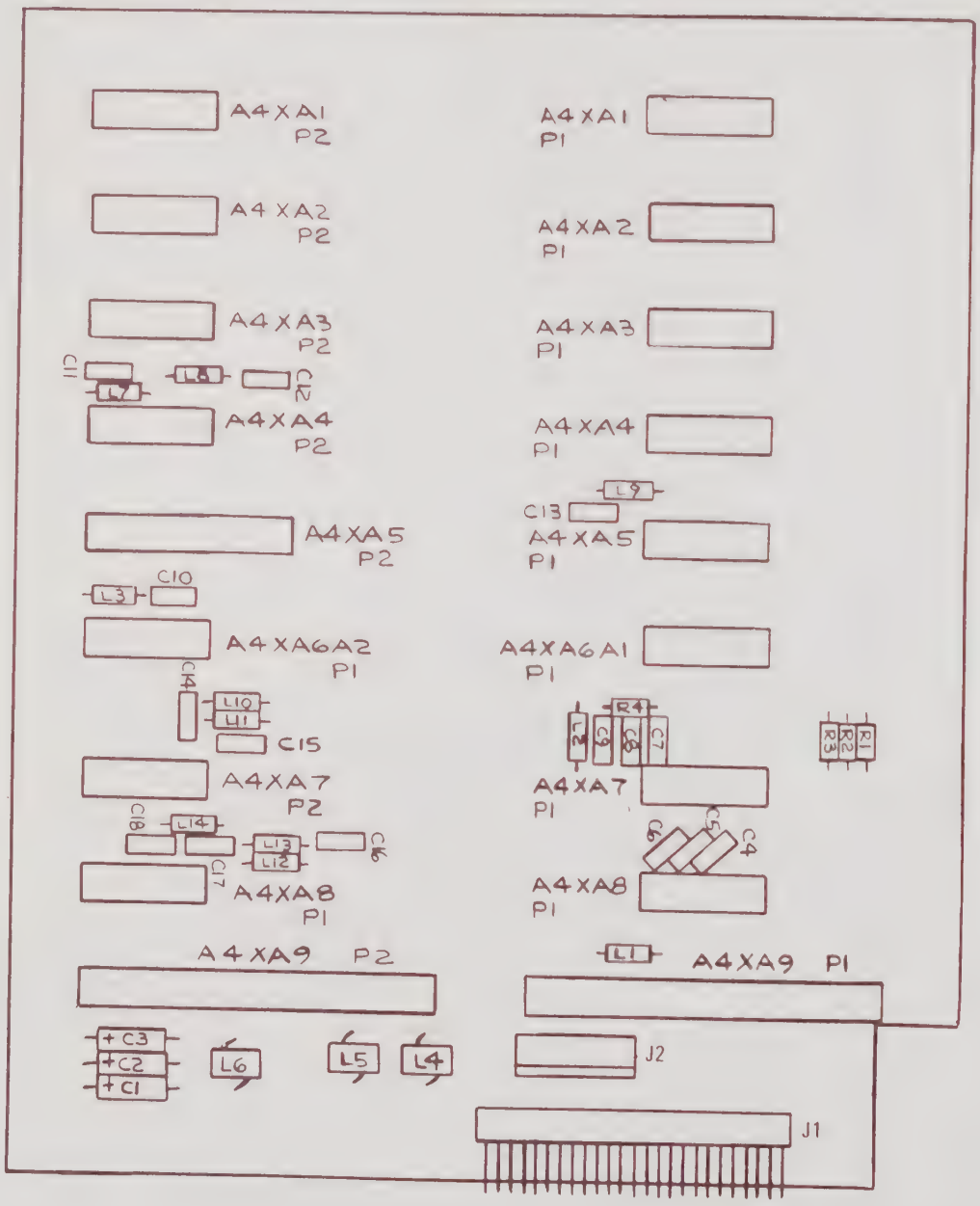


Figure 9-62. A4A10 IF-Video Motherboard, Component Locations

A3 DIGITAL STORAGE, CIRCUIT DESCRIPTION (Service Sheet 13)

A3 Digital Storage consists of three sections:

- **Input Section:** A3A8 Analog Digital Converter and A3A9 Track and Hold. This section receives the video and sweep signals, converts them to digital, and transfers the data to the Processor Section.

- **Processor Section:** A3A4 Memory, A3A5 Data Manipulator, A3A6 Main Control, and A3A7 Interface. This section handles all data transfers, data functions, and control for the data storage. The digital storage algorithm is contained in read-only memory (ROM) in A36 Main Control.

- **CRT Driver Section:** A3A1 Trigger, A3A2 Intensity Control, and A3A3 Line Generator. This section, under control of the Processor Section, generates beam control signals (X, Y, and Z) to display the memory data.

A3A9 TRACK AND HOLD, CIRCUIT DESCRIPTION (Service Sheet 14)

A3A9 Track and Hold provides circuitry to insure that the true peak of the RF signal and a true representation of noise are displayed on the CRT. This is accomplished by positive and negative peak detection.

Positive Peak Detector (A)

The Positive Peak Detector acquires the most positive voltage to appear at its input and holds that voltage on holding capacitor C26 until the circuit is reset by a reset pulse from the decoding and timing circuits. FET Q6 is periodically turned on by the reset pulse, discharging C26 through R12 and Q6 to ground. Figure 9-65 shows a simplified schematic of the Positive Peak Detector.

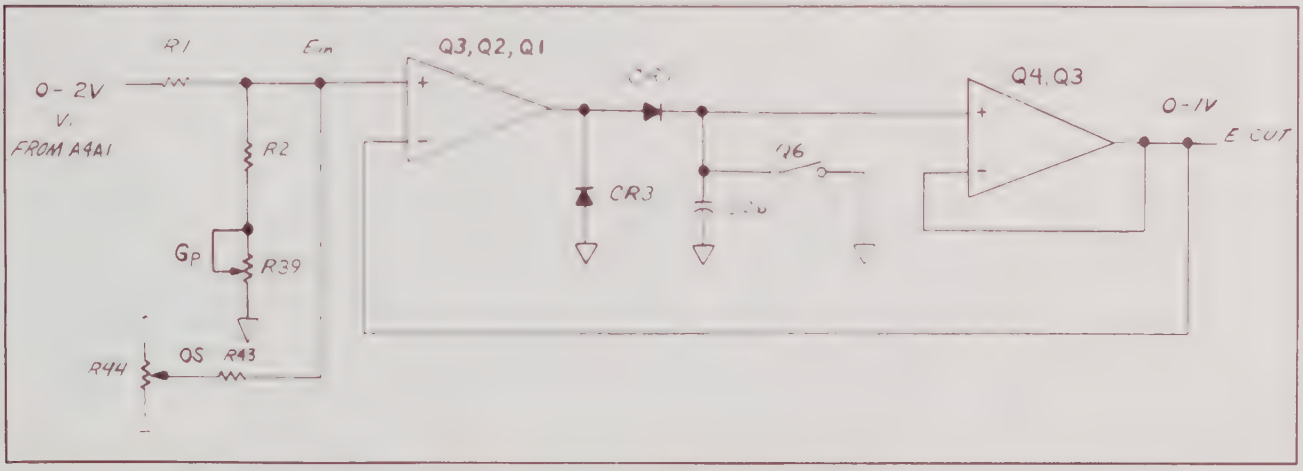


Figure 9-65. Positive Peak Detector, Simplified Schematic

The circuit consists of amplifier Q3, Q2, Q1, diode CR1, holding capacitor C26, and buffer Q4, Q3. When E_{in} is less than the feedback voltage E_{out}, CR1 is off and C26 will hold the voltage it has acquired. CR3 limits the reverse voltage across CR1 to minimize leakage current. CR1 turns on when E_{in} is greater than E_{out}, and C16 charges to equalize E_{in} and E_{out}.

A pair of matched FETs, Q4A and Q4B, and emitter follower Q3 are used in the buffer circuit. Q4A is used as a source follower and Q4B as a current source. The Q4A bias current is equal to the algebraic sum of the current from Q4B, the base current to Q3B, and the bias current through R13. This sum of currents insures a very small gate-to-source voltage and prevents gate-to-source forward biasing

Q1, Q2, and Q3 are all dual transistors. Q3 and Q2 form the input stage, with Q3 connected as emitter followers and Q2 forming a differential pair. Gain for the differential stage is set by collector resistor R7. Additional gain is provided by Q1. Q1B is connected as a transistor inverter with R16 in the emitter and R8 in the collector. Q1A is connected as a diode. Gain and offset adjustments for the positive Peak Detector are performed in the resistor divider that includes R1 and R2. G_P potentiometer R39 adjusts the attenuation so that a 2V full-scale input produces a 1V full-scale output. OS_P potentiometer R44 zeroes the output with 0V input. U5 compares the input and output of the Peak Detector. A TTL high level is produced when the output is greater than the input.

Negative Peak Detector (B)

The Negative Peak Detector acquires the most negative voltage to appear at its input and holds that voltage on holding capacitor C38 until reset by a pulse from the decoding and timing circuits. Circuit operation is the same as that of the Positive Peak Detector except that supply polarities are reversed and PNP instead of NPN transistors are used. Figure 9-66 shows a simplified schematic of the Negative Peak Detector.

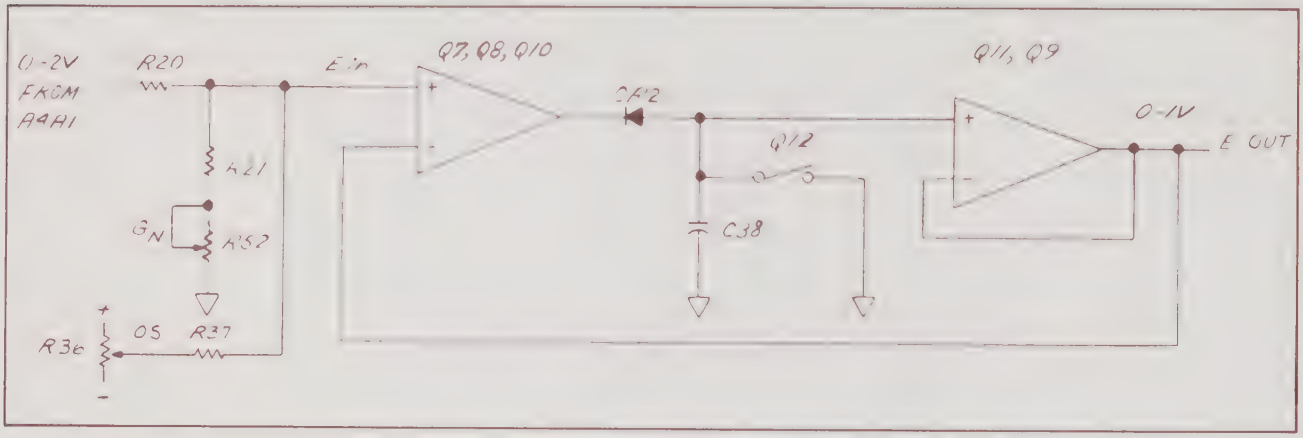


Figure 9-66. Negative Peak Detector, Simplified Schematic

The circuit consists of amplifier Q7, Q8, Q10, diode CR2, holding capacitor C38, buffer Q11,and Q9, and reset transistor Q12. R71 creates an offset between the output and the emitter of Q9. This insures that the voltage across C38 is always negative for positive outputs from 0V to +1V. G_N potentiometer R52 sets the gain (input attenuation) so that a 2V Full-Scale input produces a 1V full-scale output. OS_N potentiometer R36 zeroes the offset. U4 compares the input to the output.

Decoding and Timing (C)

The Decoding and Timing circuit provides reset pulses to the Peak Detectors and control lines for Multiplexer selection, and it performs some other logic functions.

U9A decodes control lines SEL A and SEL B to produce three lines for Multiplexer selection. After inversion by U8A, U8B, and U8C, the voltage levels are shifted to −0.5V and +10V. Multivibrators U12A and U12B produce pulses (when triggered by HOLD) which reset the Peak Detectors. Latches U13A and U13B are used to provide the Peak Detector status signal LTRAK.

Multiplexer (D)

The outputs of the Peak Detectors are multiplexed through U1 before sampling by the Track and Hold circuit. Control lines to the Multiplexer are provided by the Decoding and Timing circuit.

Track and Hold (E)

The Track and Hold circuit samples the signal appearing at the output of multiplexer U1 and holds the voltage on capacitor C15. The output of the Track and Hold circuit is used in A3A8 Analog-Digital Converter, where it is converted into Y-axis graph data. A simplified schematic of the Track and Hold circuit is shown in Figure 9-67.

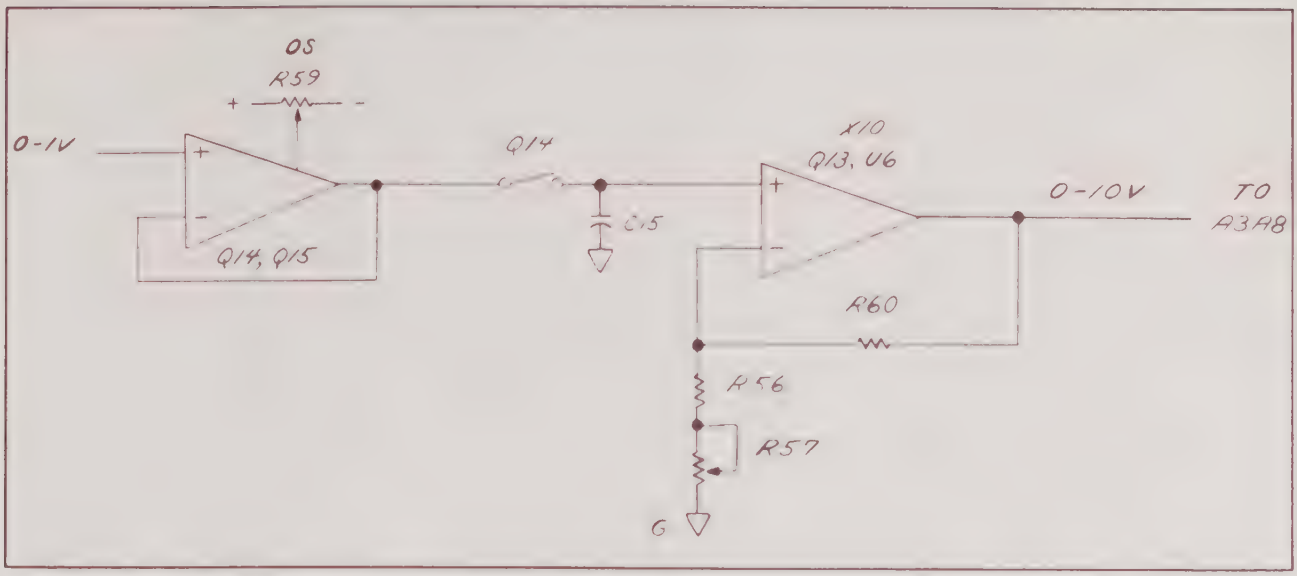


Figure 9-67. Track and Hold Circuit, Simplified Schematic

Q16 and Q15 form a buffer amplifier. Q14 switches on and off to open or close a path between the amplifier and holding capacitor C15. A FET input amplifier (Q13, U6) amplifies the capacitor voltage by a factor of 10. Gain is set by G_{OUT} potentiometer R57. Offset is adjusted by controlling the current flow through R67 with OS_{OUT} potentiometer R59.

If the voltage on TP8 is correct and that of TP9 is incorrect when performing the BIAS Check of Note 11, check to see if the drain and source voltages on Q14 are approximately +1V. If not, Q14 is most likely open.

Even if this board passes the Bias check, it may have faulty components. Several of these can be found with the aid of the [SHIFT] functions and observation of the displayed signal.

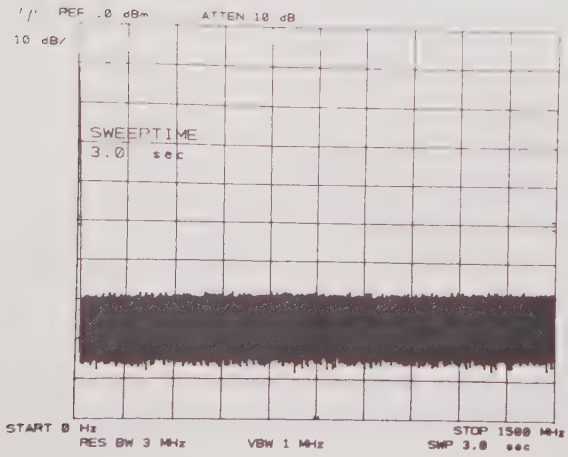
If the displayed signals are noisy, then Q6 or Q14 has developed leakage. This is most noticeable when looking at the CAL OUPUT signal with [FREQUENCY SPAN] 0 Hz.

To determine whether there is leakage of Q6 or Q14, sampling detection will be used. [TRACE A] puts the instrument in the sampling detection mode. If the signal is noisy in the sampling detection mode, there is probably Q14 leakage. If the signals are noisy in the normal detection mode or in the positive peak detection mode ([SHIFT] TRACE A [MAX HOLD]), then there is probably Q6 leakage.

To determine if the Positive and Negative Peak Detectors are working properly, key in the following:

[SWEEP TIME] ..... 3 sec (Normal Detection)
[SHIFT] TRACE A [MAX HOLD] (Positive Peak Detection)
TRACE A
TRACE A [VIEW] (Negative Peak Detection)
TRACE B [CLEAR WRITE]

The following figure on the left shows the display for the normal detection mode in a 3-second sweep time. The upper trace in the figure on the right is the output for the Positive Peak Detector. Notice that only the positive peaks of the noise are displayed. The lower trace on the right is the output of the Negative Peak Detector. Only the most negative noise peaks are displayed.



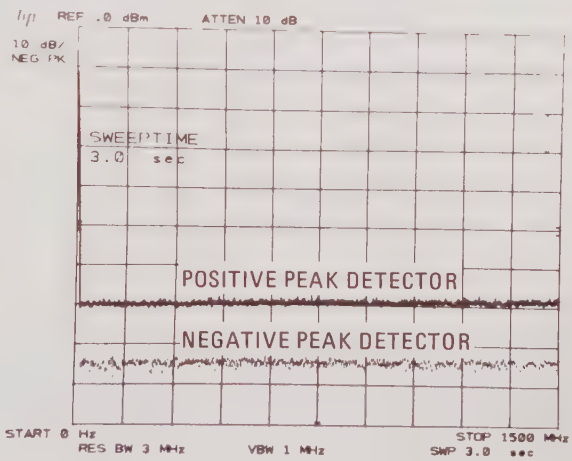


Table 9-11. A3A9 Track and Hold, Replaceable Parts (1 of 3)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A9	85662-60012	1	BOARD ASSEMBLY, TRACK AND HOLD	28480	85662-60012
A3A9C1	0160-0127	4	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3A9C2	0160-0127		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3A9C3	0180-1746	2	CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A3A9C4	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A3A9C5	0160-0127		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3A9C6	0160-0127		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3A9C7	0180-0229	1	CAPACITOR-FXD 33UF+-10% 10VDC TA	0420J	150D336X9010B2
A3A9C8	0160-2055	22	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C9	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C10	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C11	0180-0197	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A3A9C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C13	0160-3456	2	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A3A9C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C15	0160-0945	3	CAPACITOR-FXD 910PF +-5% 100VDC MICA0+70	28480	0160-0945
A3A9C16	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C17	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C18	0160-2204	2	CAPACITOR-FXD 100PF +-5% 300VDC MICA0+70	28480	0160-2204
A3A9C19	0160-2204		CAPACITOR-FXD 100PF +-5% 300VDC MICA0+70	28480	0160-2204
A3A9C20	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C21	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C22	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C23	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A3A9C24	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C25	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C26	0160-0945		CAPACITOR-FXD 910PF +-5% 100VDC MICA0+70	28480	0160-0945
A3A9C27	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C28			NOT ASSIGNED		
A3A9C29			NOT ASSIGNED		
A3A9C30	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C31	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C32	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C33	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C34	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C35	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C36	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C37	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9C38	0160-0945		CAPACITOR-FXD 910PF +-5% 100VDC MICA0+70	28480	0160-0945
A3A9C39	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A9CR1	1901-0376	2	DIODE-GEN PRP 35V 50MA DO-7	28480	1901-0376
A3A9CR2	1901-0376		DIODE-GEN PRP 35V 50MA DO-7	28480	1901-0376
A3A9CR3	1901-0535	1	DIODE-SCHOTTKY	28480	1901-0535
A3A9J1	1250-0543	2	CONNECTOR-RF SM-BNP M PC 50-OHM	0576I	51-053-0000
A3A9J2	1250-0543		CONNECTOR-RF SM-BNP M PC 50-OHM	0576I	51-053-0000
A3A9L1	9140-0096	1	COIL-MLD 1UH 10% Q=50 .155DX.375LG	02177	15-442R-6K
A3A9L2	9100-1629	2	COIL-MLD 47UH 5% Q=55 .155DX.375LG	02177	15-131R-4J
A3A9L3	9100-1629		COIL-MLD 47UH 5% Q=55 .155DX.375LG	02177	15-131R-4J
A3A9L4	9140-0210	1	COIL-MLD 100UH 5% Q=50 .155DX.375LG	02177	15-131R-12J
A3A9Q1	1853-0075	2	TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A3A9Q2	1854-0475	4	TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475
A3A9Q3	1854-0475		TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475
A3A9Q4	1855-0050	3	TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0050
A3A9Q5	1854-0019	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A3A9Q6	1855-0241	2	TRANSISTOR MOSFET N-CHAN E-MODE TO-72 SI	0291J	8D215
A3A9Q7	1853-0316	1	TRANSISTOR-DUAL PNP PD=500MW	28480	1853-0316
A3A9Q8	1853-0075		TRANSISTOR-DUAL PNP PD=400MW	28480	1853-0075
A3A9Q9	1853-0034	1	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A3A9Q10	1854-0475		TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475
A3A9Q11	1855-0050		TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0050
A3A9Q12	1853-0322	1	TRANSISTOR PNP 2N2946A SI TO-46 PD=400MW	0169M	2N2946A
A3A9Q13	1855-0050		TRANSISTOR-JFET DUAL N-CHAN D-MODE SI	28480	1855-0050
A3A9Q14	1855-0241		TRANSISTOR MOSFET N-CHAN E-MODE TO-72 SI	0291J	8D215
A3A9Q15	1854-0404	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A9Q16	1854-0475		TRANSISTOR-DUAL NPN PD=750MW	28480	1854-0475
A3A9R1	0698-3441	3	RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A3A9R2	0698-3440	4	RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A3A9R3	0757-0442	7	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A9R4	0757-0436	4	RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A3A9R5	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F

Table 9-11. A3A9 Track and Hold, Replaceable Parts (2 of 3)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A9R6	0757-0280	6	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A9R7	0757-0274	2	RESISTOR 1.21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A3A9R8	0698-0083	1	RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A3A9R9	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A3A9R10	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A9R11	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A9R12	1757-0346	1	RESISTOR 10 1% .125W F [illegible]	03298	C4-1/8-T0-10R0-
A3A9R13	0757-0465	2	RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A3A9R14	0757-0279	4	RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A3A9R15	0698-3157	7	RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A3A9R16	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A3A9R17	0698-3439	1	RESISTOR 178 1% .125W F TC=0+-100	03298	C4-1/8-T0-178R-F
A3A9R18	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A3A9R19	2100-3053	1	RESISTOR-TRMR 20 20% C SIDE-ADJ 17-TRN	73138	89PR20
A3A9R20	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A3A9R21	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A3A9R22	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A9R23	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A3A9R24	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A9R25	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A9R26	0757-0274		RESISTOR 1.21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A3A9R27	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A3A9R28	0757-0416	2	RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A3A9R29	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A3A9R30	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A3A9R31	0757-0401	5	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A3A9R32	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A3A9R33	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A3A9R34	0698-0084	1	RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A3A9R35	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A3A9R36	2100-3161	3	RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	73138	89PR20K
A3A9R37	0698-3160	2	RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A3A9R38	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A3A9R39	2100-3052	2	RESISTOR-TRMR 50 20% C SIDE-ADJ 17-TRN	73138	89PR50
A3A9R40	0698-3136	2	RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A3A9R41	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A3A9R42	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A3A9R43	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A3A9R44	2100-3161		RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	73138	89PR20K
A3A9R45	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A3A9R46	0698-3136		RESISTOR 17.8K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1782-F
A3A9R47	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A3A9R48	0757-0289	1	RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MFMC1/8-T0-1332-F
A3A9R49	0757-0440	1	RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A3A9R50	0757-1094	1	RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A3A9R51	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A9R52	2100-3052		RESISTOR-TRMR 50 20% C SIDE-ADJ 17-TRN	73138	89PR50
A3A9R53	0698-0085	1	RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A3A9R54	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A3A9R55	0698-3157		RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A3A9R56	0757-0422	1	RESISTOR 909 1% .125W F TC=0+-100	03298	C4-1/8-T0-909R-F
A3A9R57	2100-3095	1	RESISTOR-TRMR 200 10% C SIDE-ADJ 17-TRN	73138	89PR200
A3A9R58	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A3A9R59	2100-3161		RESISTOR-TRMR 20K 10% C SIDE-ADJ 17-TRN	73138	89PR20K
A3A9R60	0757-0288	1	RESISTOR 9.09K 1% .125W F TC=0+-100	0299E	MFMC1/8-T0-9091-F
A3A9R61	0757-0441	1	RESISTOR 8.25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A3A9R62			NOT ASSIGNED		
A3A9R63			NOT ASSIGNED		
A3A9R64	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A3A9R65	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A9R66	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A9R68	0757-0417	1	RESISTOR 562 1% .125W F TC=0+-100	03298	C4-1/8-T0-562R-F
A3A9R68	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A3A9R69	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A9R70	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A9R71	0698-3441		RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A3A9TP1	0360-0535	10	TERMINAL, TEST POINT	[illegible]	0360-0535
A3A9TP2	0360-0535		TERMINAL, TEST POINT	[illegible]	0360-0535
A3A9TP3	0360-0535		TERMINAL, TEST POINT	[illegible]	0360-0535
A3A9TP4	0360-0535		TERMINAL, TEST POINT	[illegible]	0360-0535
A3A9TP5	0360-0535		TERMINAL, TEST POINT	[illegible]	0360-0535
A3A9TP6	0360-0535		TERMINAL, TEST POINT	[illegible]	0360-0535
A3A9TP7	0360-0535		TERMINAL, TEST POINT	[illegible]	0360-0535
A3A9TP8	0360-0535		TERMINAL, TEST POINT	[illegible]	0360-0535
A3A9TP9	0360-0535		TERMINAL, TEST POINT	[illegible]	0360-0535
A3A9TP10	0360-0535		TERMINAL, TEST POINT	[illegible]	0360-0535

Table 9-11. A3A9 Track and Hold, Replaceable Parts (3 of 3)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A9U1	1826-0415	1	IC SWITCH	0291J	SD5000B
A3A9U2	1810-0207	1	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R22K
A3A9U3	1810-0037	1	NETWORK-RES 16-PIN-DIP .1-PIN-SPCG	0248C	760 SERIES/16 PIN
A3A9U4	1826-0026	2	IC COMPARATOR	0340F	LM311M
A3A9U5	1826-0026		IC COMPARATOR	0340F	LM311M
A3A9U6	1826-0089	1	IC 2525 OP AMP	0379I	HA2-2525-5
A3A9U7	1810-0205	1	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R4.7K
A3A9U8	1820-0471	1	IC INV TTL HEX 1-INP	02233	7406PC
A3A9U9	1820-1281	1	IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	0379D	AM74LS139
A3A9U10	1820-1202	1	IC GATE TTL LS NAND TPL 3-INP	02233	9LS10PC
A3A9U11	1820-1197	1	IC GATE TTL LS NAND QUAD 2-INP	0169M	SN74L800N
A3A9U12	1820-1423	1	IC MV TTL LS MONOSTBL RETRIG DUAL	0169M	SN74LS123N
A3A9U13	1820-1112	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG	0169M	SN74LS74N
			A3A9 MISCELLANEOUS PARTS		
	1480-0073	1	PIN:DRIVE 0.250" LG	.....	1480-0073
	4040-0756	1	EXTRACTOR-PC BOARD WHT POLYC	28480	4040-0756

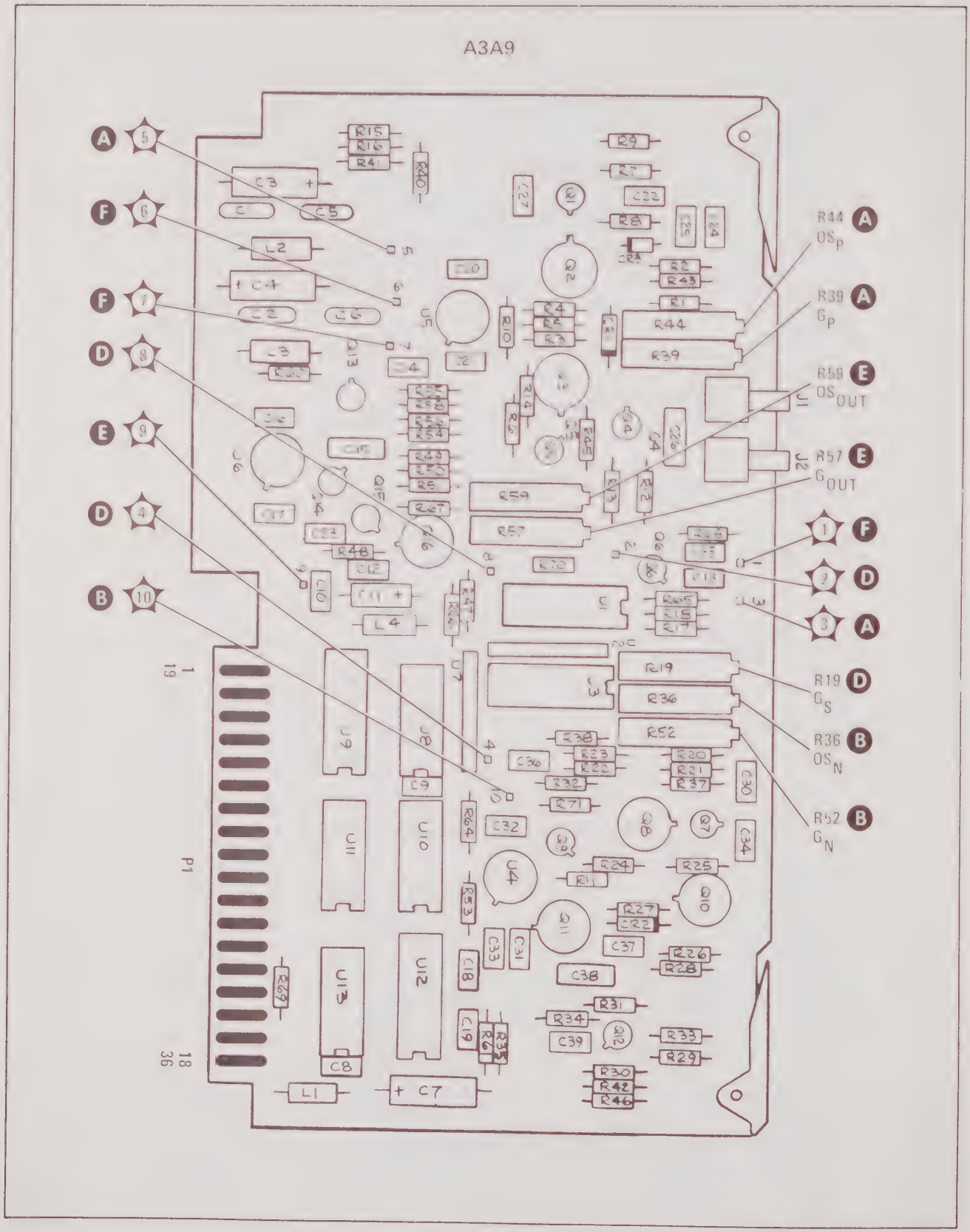


Figure 9-68. A3A9 Track and Hold, Component Locations

A3A4 MEMORY, CIRCUIT DESCRIPTION (Service Sheet 16)

A3A4 Memory contains 4096 12-bit words of random-access memory (RAM) storage and 2048 8-bit words of read-only memory (ROM) storage.

4K x 12 MEMORY (E)

Each of the RAMs U1 through U12 contains 4096 bits of storage. Stored in memory are all data that may be displayed on the CRT, including display annotation data (center frequency, reference level, etc.), graticules, characters, and Trace A, Trace B, and Trace C data.

Character Stroke Memory (G)

U13 is a 16,384-bit ROM in which is stored the stroke description of each character: the length and direction of each stroke required to "draw" a character and blanking data.

Memory Address Register (A)

U16 and U17 hold the address during memory access.

Memory Data Register (D)

U15 and U18 hold data while it is being written into memory.

Memory Output Buffer (C)

U14 and U19 are buffers to output memory data onto the Digital Storage Bus.

Chip Enable Driver (B)

U20 provides a 12-volt clock driver for the RAMs.

Stroke Counter (F)

U22 is a 4-bit counter used in the character display routine.

Table 9-13. A3A4 Memory, Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A4	85662-60023	1	BOARD ASSEMBLY, MEMORY	28480	85662-60023
A3A4C1	0160-4084	16	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C2	0180-2144	1	CAPACITOR-FXD 200UF+75-10% 25VDC AL	0420J	300207G025DM9
A3A4C3	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C4	0160-0127	10	CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3A4C5	0180-1746	5	CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A3A4C6	0180-0374	1	CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A3A4C7	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C8	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C9	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C10	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A3A4C11	0160-0127		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3A4C12	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A3A4C13	0160-0127		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3A4C14	0160-0127		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3A4C15	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C16	0160-0127		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3A4C17	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C18	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C19	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C20	0160-0127		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3A4C21	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A3A4C22	0160-0127		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3A4C23	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C24	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C25	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C26	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C27	0160-0127		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3A4C28	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A3A4C29	0160-0127		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3A4C30	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C31	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C32	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A4C33	0160-0127		CAPACITOR-FXD 1UF +-20% 25VDC CER	28480	0160-0127
A3A4L1	9140-0171	1	COIL-MLD 40UH 10% Q=20 .296DX.968LG	28480	9140-0171
A3A4L2	9140-0210	1	COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A3A4R1	0757-0280	1	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A4U1	1818-0156	12	IC TMS4060N 4K RAM NMOS	28480	1818-0156
A3A4U2	1818-0156		IC TMS4060N 4K RAM NMOS	28480	1818-0156
A3A4U3	1818-0156		IC TMS4060N 4K RAM NMOS	28480	1818-0156
A3A4U4	1818-0156		IC TMS4060N 4K RAM NMOS	28480	1818-0156
A3A4U5	1818-0156		IC TMS4060N 4K RAM NMOS	28480	1818-0156
A3A4U6	1818-0156		IC TMS4060N 4K RAM NMOS	28480	1818-0156
A3A4U7	1818-0156		IC TMS4060N 4K RAM NMOS	28480	1818-0156
A3A4U8	1818-0156		IC TMS4060N 4K RAM NMOS	28480	1818-0156
A3A4U9	1818-0156		IC TMS4060N 4K RAM NMOS	28480	1818-0156
A3A4U10	1818-0156		IC TMS4060N 4K RAM NMOS	28480	1818-0156
A3A4U11	1818-0156		IC TMS4060N 4K RAM NMOS	28480	1818-0156
A3A4U12	1818-0156		IC TMS4060N 4K RAM NMOS	28480	1818-0156
A3A4U13	1818-0293	1		28480	1818-0293
A3A4U14	1820-1492	2	IC BFR TTL LS INV HEX 1-INP	0169M	SN74LS368N
A3A4U15	1820-1196	4	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS174N
A3A4U16	1820-1196		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS174N
A3A4U17	1820-1196		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS174N
A3A4U18	1820-1196		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS174N
A3A4U19	1820-1492		IC BFR TTL LS INV HEX 1-INP	0169M	SN74LS368N
A3A4U20	1820-1982	1	IC DRVR TTL* DUAL	0169M	SN75363N
A3A4U21	1826-0147	1	IC 7812 V REGLTR	02238	7812UC
A3A4U22	1820-1278	1	IC CNTR TTL LS BIN UP/DOWN SYNCHRO	0169M	SN74LS191N
A3A4VR1	1902-0041	1	DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	02038	BZ 10939-98
			A3A4 MISCELLANEOUS PARTS		
	1480-0073	1	PINIDRIVE 0.250" LG	[illegible]	1480-0073
	4040-0752	1	EXTRACTOR-PC BOARD YEL POLYC	28480	4040-0752

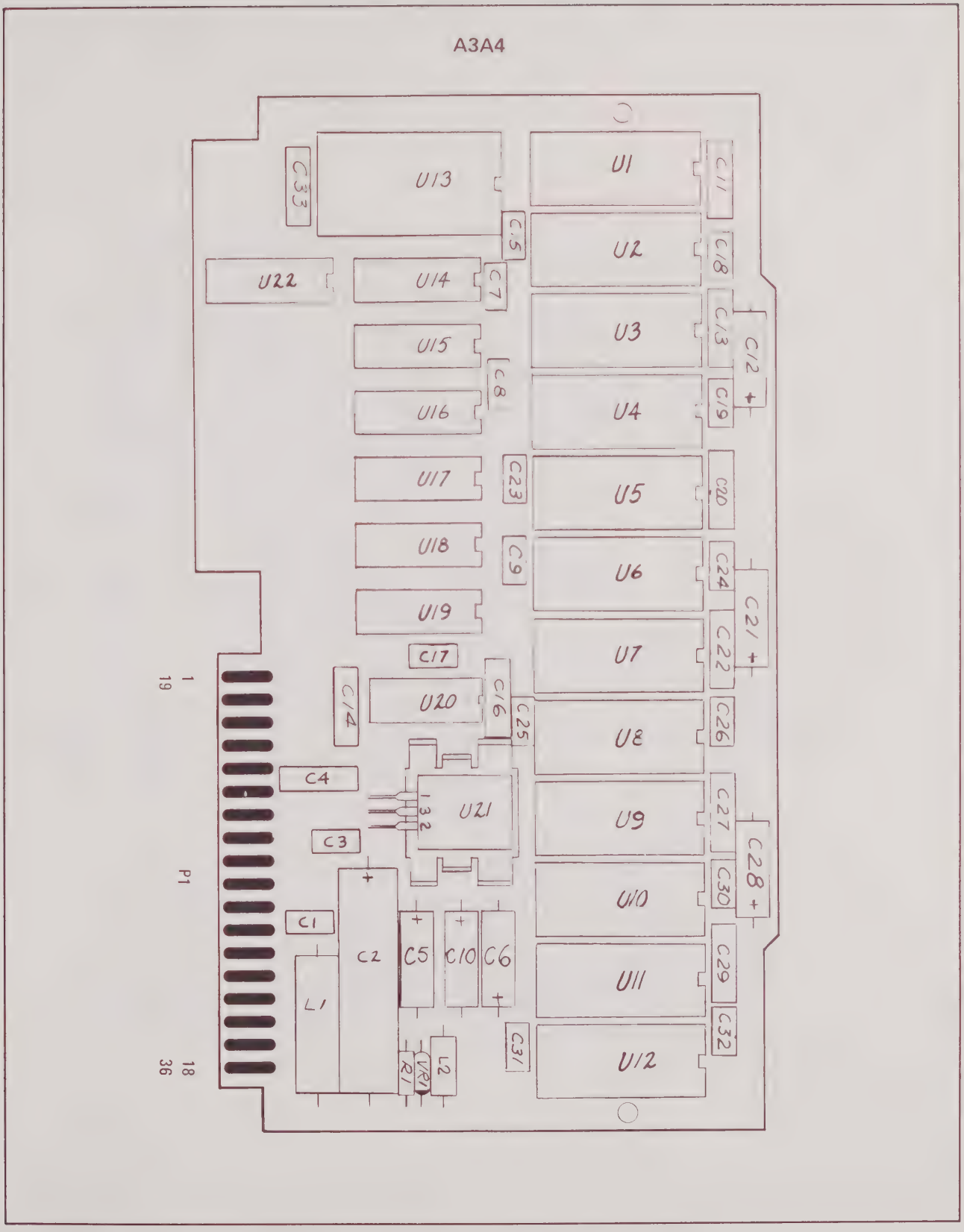


Figure 9-77. A3A4 Memory, Component Locations

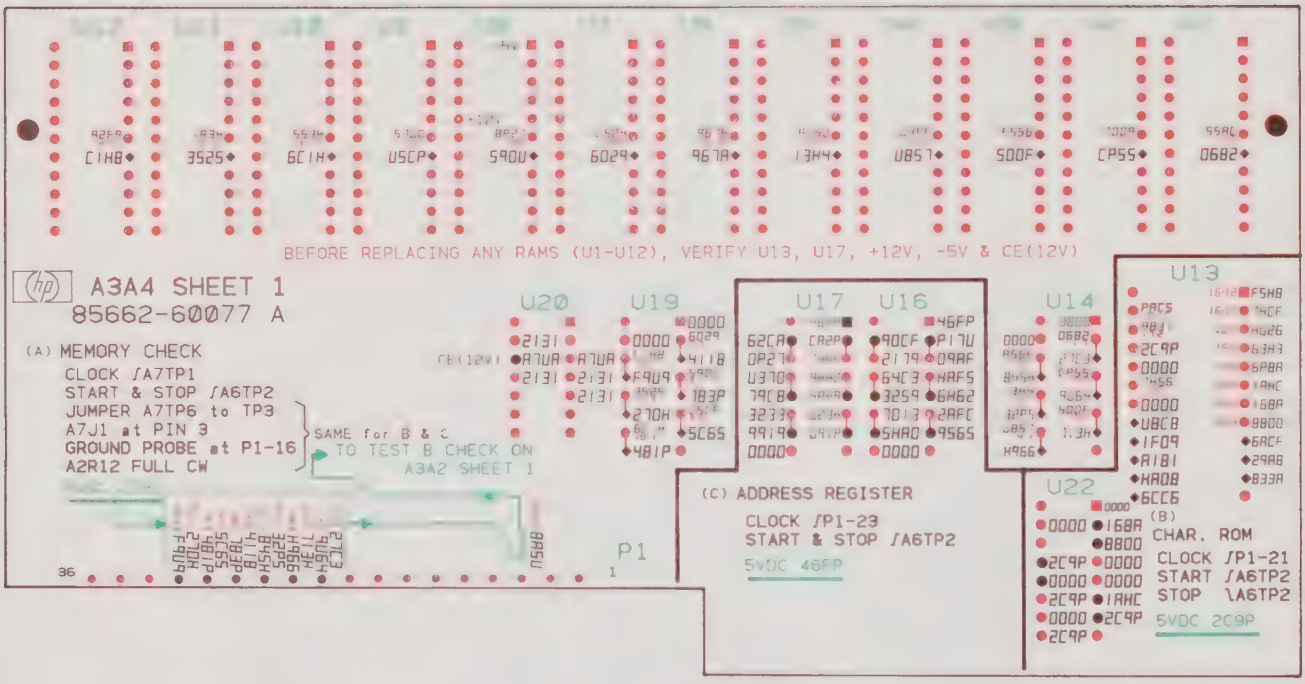


Figure 9-78. A3A4 Memory, Signature Analysis Troubleshooting Diagram

A3A2 INTENSITY CONTROL,CIRCUIT DESCRIPTION (Service Sheet 18)

A3A2 Intensity Control provides the following functions:

- It receives ΔX and ΔX signals from A3A3 Line Generator, approximates the line length, and controls the Z-axis level to the display.
- It sets and controls the duration of the Line Generator drawing period, which is either 4 μsec or 19 μsec, depending on the approximate line length.
- It provides drive signals to Line Generator switches.
- It controls all display blanking.
- It multiplexes digital storage (Line Generator) X, Y, Z,and blanking with direct display of fast sweep, video, fast sweep Z, and retrace blanking.

Intensity level is modulated as a function of ΔX and ΔY. The Line Generator Z-Axis circuit receives ΔX and ΔY from A3A3 Line Generator. The magnitudes of ΔX and ΔY are summed together to approximate line length. The output of the Line Generator Z-Axis circuit goes to the Bright circuit, which sets the Z-axis signal to maximum when bright lines are drawn. The signal from the Bright circuit is multiplexed with the FSZ signal from A3A1 Trigger and becomes the Z signal to the display. The Z signal also goes to the AUX Z circuit, where Z and AUX BLANK are combined to form the AUX Z signal.

The line length approximation from the Line Generator Z-Axis circuit goes to the Long Line Comparator, which decides whether the line should be drawn as a long line (19 μsec drawing time) or a short line (4 μsec drawing time). This decision is stored at the Input Register and sent to the Line Generator as the $\overline{\text{LL}}$ signal. It goes with LGCLK to the Long Line/Short Line Timing circuit, which generates the timing signals necessary to control the Line Generator setup and drawing periods. The signal INTR is used by A3A6 Main Control to determine when to send new X and Y values to the Line Generator. The timing signals also go to the Integrator Switch Driver and to the Sample and Hold Driver, which form the drive signals needed for the Line Generator.

Control of display blanking begins at the Input Register. Blank and blink information are held in the register during the line drawing period. The Blanking Logic circuit controls all display blanking. It unblanks, blanks, or blinks lines as required by the Input Register. It multiplexes digital storage blanking with fast-sweep retrace blanking.

Fast Scan Trigger Detect and Bus Buffer circuits are used to provide information to A3A6 Main Control to create the digital storage display.

Line Generator Z-Axis (J)

ΔX and ΔY are received from A3A3 Line Generator. U17 and associated circuitry is a magnitude detector. For positive ΔX, CR1 is forward biased, U17 output goes negative, and CR2 cathode is at 0V. For negative ΔX, CR1 is reverse biased, U17 output goes positive, and CR2 cathode is −ΔX volts (or |ΔX|). Since R15=2R7=R1, the signal at CR5 anode due to ΔX alone is −ΔX. When added to the output of the ΔY magnitude detector, the signal at CR5 anode is (−|ΔX|−|ΔY|), which is a rough approximation of line length. The signal at CR7 anode is equal to the signal at CR5 anode except when CR5 anode is more positive than −0.1V. R16 and R17 prevent CR7 anode from rising above −0.1V.

The line length signal (−|ΔX|−|ΔY|) is sampled by U5 during the setup period of A3A3 Line Generator. Switches Q2 and Q4 are closed during sampling. The signal is held on C3 during the drawing period. Switches Q1 and Q3 are closed during the hold mode.

For dim lines, the DIM signal is high, and switch A of analog switch U1A is closed to lower the gain of the Sample and Hold circuit.

U1A switch B is closed during long lines (19 μsec drawing period).

Bright (K)

For bright lines (BRIGHT signal high), switch C of U1B is closed to set the signal LGZ to +2V.

Digital Storage/Fast Scan Mux (M)

This circuit provides multiplexing between the digital storage display (Line Generator) and the fast scan display (video and fast sweep). For the digital storage display, LGX, LGY, and LGZ are connected to X, Y, and Z by U15 and U14. For the fast scan display, FS OUT (fast sweep output), VIDEO, and FSZ (fast sweep Z axis) are selected.

Long Line Comparator (L)

The Long Line Comparator receives the line length approximation from CR7 cathode and compares it with the long-line threshold (LL THRESHOLD adjustment R12). U4 pin 7 goes high when the approximation has greater magnitude than the threshold.

Input Register (C)

The signal from the Long Line Comparator and line intensity information are stored in the Input Register when a positive edge occurs on the INTR line. The Input Register is updated for each line drawn on the display. Signal FS is used to select the fast scan display (fast sweep and video).

Blink (D)

The output of U12 is a 1-Hz signal with a 90 percent duty cycle. When enabled by the BLINK command stored in the Input Register, this signal causes display blinking.

Long Line/Short Line Timing (B)

This circuit receives signal LGCLK from A3A7 Interface and signal LL from the Input Register. It generates signal INTR, which is a string of 1-μsec pulses. When LL is low the pulses are spaced 5 μsec apart; when LL is high the pulses are 20 μsec apart. This provides the timing signals for the 4- and 19-μsec Line Generator drawing periods and 1-μsec setup period.

Integrator Switch Driver (E)

This circuit provides the drive signals for the Integrator switches in A3A3 Line Generator. Q13 and Q14 form a complementary driver. When the input is low, Q13 is on and Q14 is off, setting INTG to -5V and $\overline{\text{INTG}}$ to 4.7V nominal. When the input is high, Q13 is off and 14 is on, setting INTG to $+7.3$V nominal and $\overline{\text{INTG}}$ to -5V.

Sample and Hold Switch Driver (G)

This circuit provides the drive signals for the Sample and Hold circuits of the Line Generator X, Y, and Z axes. Q10 and Q12 form a complementary driver. A -9.6V reference is provided by Q11 and associated circuitry. Q9 is a level translator. When U11 pin 11 goes low, Q9 collector goes to -10.3V, turning Q10 off and Q12 on. Signals HLDX and HLDY go to 0V, and signal SMPL goes to -7.6V nominal. When U11 pin 11 goes high, Q9 collector goes to -8.9V, turning Q10 on and Q12 off. SMPL goes to 0V and Q10 collector goes to -8.4V nominal. Potentiometers R50 (X S&H BAL) and R51 (Y S&H BAL) are used to adjust the HLDX and HLDY drive levels to A3A3 Line Generator. C18 and Q5 provide a speed-up to the rising edges of the HLDX and HLDY signals. As U11 pin 11 goes from high to low, the base of Q5 goes low, causing Q5 to turn on and the HLDX and HLDY signals to rise almost instantaneously.

Blanking Logic (F)

This circuit provides all display blanking. It multiplexes the retrace blanking of the fast scan display (direct video and fast sweep) with the digital storage blanking. For the digital storage display it provides blanking or unblanking as specified by signals LLGBLANK, BLINK, DOTEN, and INTR. R30, R27, C16, R28, R32, and C15 are delay circuits which match the delay of the $\overline{\text{BLANK}}$ signal to the delay of the Line Generator. R31, R29, and C14 match the retrace blanking delay to the fast sweep delay.

AUX Z (N)

The AUX Z circuit receives the $\overline{\text{BLANK}}$ signal from the Blanking Logic and the Z signal from the Digital Storage/Fast Scan Mux. It generates the AUX BLANK and AUX Z signals. R65 and R62 convert the 0 — 2V range of Z to the 0 — 1V range necessary for variation of AUX Z intensity. U8 is a voltage follower with Q6 providing a high current output.

Blanking causes the AUX Z signal to drop to -1V or less. When AUX BLANK goes high, Q7 turns off and Q8 turns on, causing AUX Z to go negative. When AUX BLANK is low, Q7 is on and Q8 is off.

Fast Scan Trigger Detect H

This circuit is used to detect the occurrence of a fast scan trigger. When LRTRC, the retrace signal, goes high, a fast scan has been triggered. Flip-flop U18B is set by the postive edge of LRTRC. U18B is reset by LRST0.

Bus Buffer I

This circuit buffers status signals onto the Digital Storage Bus.

Table 9-15. A3A2 Intensity Control, Replaceable Parts (1 of 3)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A2	85662-60025	1	BOARD ASSEMBLY, INTENSITY CONTROL	28480	85662-60025
A3A2C1	0160-2249	1	CAPACITOR-FXD 4.7PF +-.25PF 500VDC	28480	0160-2249
A3A2C2	0160-2264	2	CAPACITOR-FXD 20PF +-5% 500VDC CER0+-30	28480	0160-2264
A3A2C3	0140-0198	1	CAPACITOR-FXD 200PF +-5% 300VDC MICA	72136	DM15F201J0300WV1CR
A3A2C4	0160-2202	1	CAPACITOR-FXD 75PF +-5% 300VDC	28480	0160-2202
A3A2C5	0160-4084	17	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C6	0180-0228	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	150D226X9015B2
A3A2C7	0180-0374	3	CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A3A2C8	0180-0374		CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A3A2C9	0180-0374		CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A3A2C10	0160-2055	4	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A2C11	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A2C12	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A2C13	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C14	0160-2257	1	CAPACITOR-FXD 10PF +-5% 500VDC CER0+-60	28480	0160-2257
A3A2C15	0160-2264		CAPACITOR-FXD 20PF +-5% 500VDC CER0+-30	28480	0160-2264
A3A2C16	0140-0192	1	CAPACITOR-FXD 68PF +-5% 300VDC	72136	DM15E680J0300WV1CR
A3A2C17	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C18	0160-2204	1	CAPACITOR-FXD 100PF +-5% 300VDC MICA0+70	28480	0160-2204
A3A2C19	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C20	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C21	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C22	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C23	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C24	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C25	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C26	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C27	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C28	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C29	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C30	0140-0205	1	CAPACITOR-FXD 62PF +-5% 300VDC	72136	DM15E620J0300WV1CR
A3A2C31	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C32	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C33	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A2C34	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A2CR1	1901-0040	12	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR3	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR4	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR5	1901-0518	5	DIODE-SCHOTTKY	28480	1901-0518
A3A2CR6	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A3A2CR7	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A3A2CR8	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR9	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR10	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR11	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR12	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR13	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR14	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2CR15	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A3A2CR16	1901-0518		DIODE-SCHOTTKY	28480	1901-0518
A3A2CR17	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A2J1	1250-0543	2	CONNECTOR-RF SM-SNP M PC 50-OHM	0576I	51-053-0000
A3A2J2	1250-0543		CONNECTOR-RF SM-SNP M PC 50-OHM	0576I	51-053-0000
A3A2L1	9140-0210	2	COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A3A2L2	08558-80011	1	FILTER, COIL, BLUE	28480	08558-80011
A3A2L3	9140-0237	1	COIL-MLD 200UH 5% Q=65 .155DX.375LG	02178	15-1315-19J
A3A2L4			NOT ASSIGNED		
A3A2L5	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A3A2Q1	1855-0081	4	TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A3A2Q2	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A3A2Q3	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A3A2Q4	1855-0081		TRANSISTOR J-FET 2N5245 N-CHAN D-MODE SI	0169H	2N5245
A3A2Q5	1853-0007	6	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02030	2N3251
A3A2Q6	1854-0404	3	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A2Q7	1853-0034	1	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A3A2Q8	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02030	2N3251
A3A2Q9	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02030	2N3251
A3A2Q10	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A2Q11	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02030	2N3251
A3A2Q12	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A2Q13	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02030	2N3251
A3A2Q14	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02030	2N3251

Table 9-15. A3A2 Intensity Control, Replaceable Parts (2 of 3)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A2R1	0757-0449	7	RESISTOR 20K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2002-F
A3A2R2	0757-0449		RESISTOR 20K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2002-F
A3A2R3	0757-0449		RESISTOR 20K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2002-F
A3A2R4	0757-0449		RESISTOR 20K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2002-F
A3A2R5	0757-0449		RESISTOR 20K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2002-F
A3A2R6	0757-0449		RESISTOR 20K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2002-F
A3A2R7	0757-0442	9	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A2R8	0698-3153	2	RESISTOR 3,83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A3A2R9	0698-3156	1	RESISTOR 14,7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A3A2R10	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A2R11	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A2R12	2100-3354	1	RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	73138	72-149-0
A3A2R13	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A2R14	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A2R15	0757-0449		RESISTOR 20K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2002-F
A3A2R16	0757-0438	5	RESISTOR 5,11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A3A2R17	0698-3459	1	RESISTOR 383K 1% .125W F TC=0+-100	28480	0698-3459
A3A2R18	0757-0438		RESISTOR 5,11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A3A2R19	0757-0280	3	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A2R20	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A2R21	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A2R22	0757-0443	1	RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1102-F
A3A2R23	0757-0421	1	RESISTOR 825 1% .125W F TC=0+-100	03298	C4-1/8-T0-8250-F
A3A2R24	0698-3157	3	RESISTOR 19,6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A3A2R25	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A2R26	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A2R27	0757-0422	3	RESISTOR 909 1% .125W F TC=0+-100	03298	C4-1/8-T0-9090-F
A3A2R28	0757-0317	3	RESISTOR 1,33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A3A2R29	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	03298	C4-1/8-T0-9090-F
A3A2R30	0757-0317		RESISTOR 1,33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A3A2R31	0757-0317		RESISTOR 1,33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A3A2R32	0757-0422		RESISTOR 909 1% .125W F TC=0+-100	03298	C4-1/8-T0-9090-F
A3A2R33	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A2R34	0698-0084	1	RESISTOR 2,15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A3A2R35	0757-1094	1	RESISTOR 1,47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A3A2R36	0698-3435	1	RESISTOR 38,3 1% .125W F TC=0+-100	03298	C4-1/8-T0-38R3-F
A3A2R37	0698-3151	1	RESISTOR 2,87K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2871-F
A3A2R38	0757-0398	1	RESISTOR 75 1% .125W F TC=0+-100	03298	C4-1/8-T0-75R0-F
A3A2R39	0757-0401	2	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A3A2R40	0698-3446	2	RESISTOR 383 1% .125W F TC=0+-100	03298	C4-1/8-T0-383R-F
A3A2R41	0757-0438		RESISTOR 5,11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A3A2R42	0757-0394	2	RESISTOR 51,1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A3A2R43	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A3A2R44	0757-0460	1	RESISTOR 61,9K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6192-F
A3A2R45	0757-0288	1	RESISTOR 9,09K 1% .125W F TC=0+-100	0299E	MFSC1/8-T0-9091-F
A3A2R46	0757-0419	2	RESISTOR 681 1% .125W F TC=0+-100	03298	C4-1/8-T0-681R-F
A3A2R47	0757-0278	1	RESISTOR 1,78K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1781-F
A3A2R48	0698-3155	1	RESISTOR 4,64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A3A2R49	0757-0394		RESISTOR 51,1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A3A2R50	2100-3351	2	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	73138	72-142-0
A3A2R51	2100-3351		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	73138	72-142-0
A3A2R52	0698-3443	1	RESISTOR 287 1% .125W F TC=0+-100	03298	C4-1/8-T0-287R-F
A3A2R53	0757-0438		RESISTOR 5,11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A3A2R54	0698-0082	1	RESISTOR 464 1% .125W F TC=0+-100	03298	C4-1/8-T0-4640-F
A3A2R55	0757-0438		RESISTOR 5,11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A3A2R56	0698-3150	1	RESISTOR 2,37K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2371-F
A3A2R57	0757-0428	1	RESISTOR 1,62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A3A2R58	0757-0416	1	RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A3A2R59	0698-3442	1	RESISTOR 237 1% .125W F TC=0+-100	03298	C4-1/8-T0-237R-F
A3A2R60	0698-3446		RESISTOR 383 1% .125W F TC=0+-100	03298	C4-1/8-T0-383R-F
A3A2R61	0757-0419		RESISTOR 681 1% .125W F TC=0+-100	03298	C4-1/8-T0-681R-F
A3A2R62	0698-3157		RESISTOR 19,6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A3A2R63	0698-3153		RESISTOR 3,83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A3A2R64	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A2R65	0698-3157		RESISTOR 19,6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A3A2R66	0757-0405	1	RESISTOR 162 1% .125W F TC=0+-100	03298	C4-1/8-T0-162R-F
A3A2TP1	0360-0535	13	TERMINAL, TEST POINT	28480	0360-0535
A3A2TP2	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A2TP3	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A2TP4	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A2TP5	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A2TP6	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A2TP7	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A2TP8	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A2TP9	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A2TP10	0360-0535		TERMINAL, TEST POINT	28480	0360-0535

Table 9-15. A3A2 Intensity Control, Replaceable Parts (3 of 3)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A2TP11	0360-0535		TERMINAL, TEST POINT		
A3A2TP12	0360-0535		TERMINAL, TEST POINT		
A3A2TP13	0360-0535		TERMINAL, TEST POINT		
A3A2U1	1820-1548	1	IC SW CMOS BILATL QUAD	02036	MC14066BCL
A3A2U2	1820-1196	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS174N
A3A2U3	1820-1197	1	IC GATE TTL LS NAND QUAD 2-INP	0169M	SN74LS00N
A3A2U4	1826-0026	1	IC COMPARATOR	0340F	LM311M
A3A2U5	1826-0081	5	IC 318 OP AMP	0379D	LM318
A3A2U6	1820-1415	1	IC SCHMITT-TRIG TTL LS NAND DUAL 4-INP	0169M	SN74LS13N
A3A2U7	1820-1425	1	IC SCHMITT-TRIG TTL LS NAND QUAD 2-INP	0169M	SN74LS132N
A3A2U8	1826-0081		IC 318 OP AMP	0379D	LM318
A3A2U9	1826-0081		IC 318 OP AMP	0379D	LM318
A3A2U10	1820-1199	1	IC INV TTL LS HEX 1-INP	0169M	SN74LS04N
A3A2U11	1820-0054	1	IC GATE TTL NAND QUAD 2-INP	02236	7400PC
A3A2U12	1826-0180	1	IC 555	0291J	NE555V
A3A2U13	1820-1432	1	IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	0169M	SN74LS163N
A3A2U14	1826-0417	2	IC SWITCH	0340F	NF13333D
A3A2U15	1826-0417		IC SWITCH	0340F	NF13333D
A3A2U16	1826-0081		IC 318 OP AMP	0379D	LM318
A3A2U17	1826-0081		IC 318 OP AMP	0379D	LM318
A3A2U18	1820-1112	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG	0169M	SN74LS74N
A3A2U19	1820-1491	1	IC BFR TTL LS NON-INV HEX 1-INP	0169M	SN74LS367N
A3A2VR1	1902-0554	1	DIODE-ZNR 10V 5% DO-15 PD=1W TC=+.06%	28480	1902-0554
A3A2VR2	1902-0025	1	DIODE-ZNR 10V 5% DO-7 PD=.4W TC=+.06%	02236	FZ7260
A3A2VR3	1902-3092	1	DIODE-ZNR 4.99V 2% DO-7 PD=.4W TC=-.012%	02036	BZ 10939-96
A3A2VR4	1902-3130	1	DIODE-ZNR 6.25V 5% DO-7 PD=.4W TC=+.053%	02236	FZ7252
			A3A2 MISCELLANEOUS PARTS		
	1480-1112	1	PIN:DRIVE 0.062" DIA	28480	1480-1112
	4040-6750		EXTRACTOR, PC BOARD RED, POLYC		4040-6750

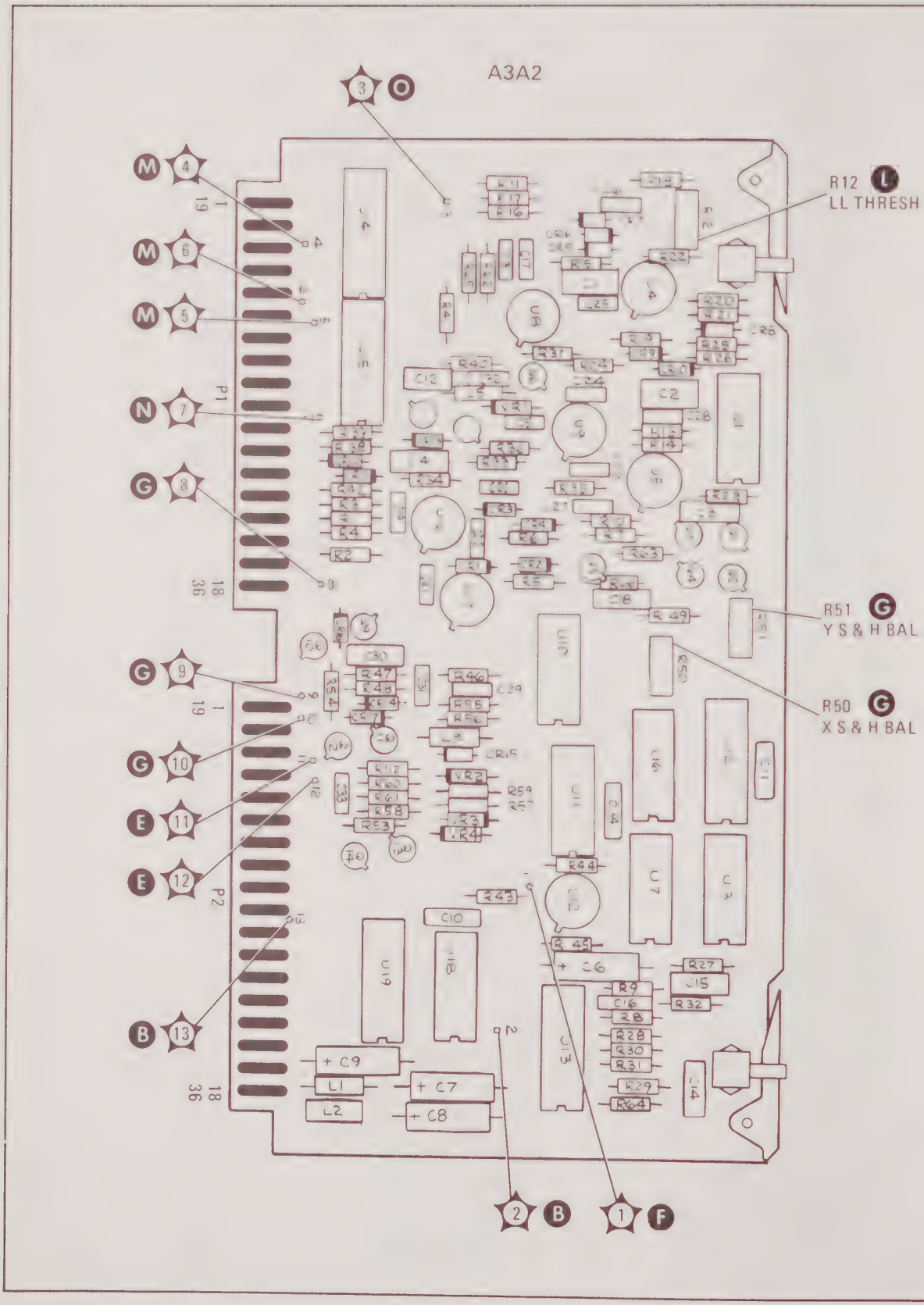


Figure 9-88. A3A2 Intensity Control, Component Locations

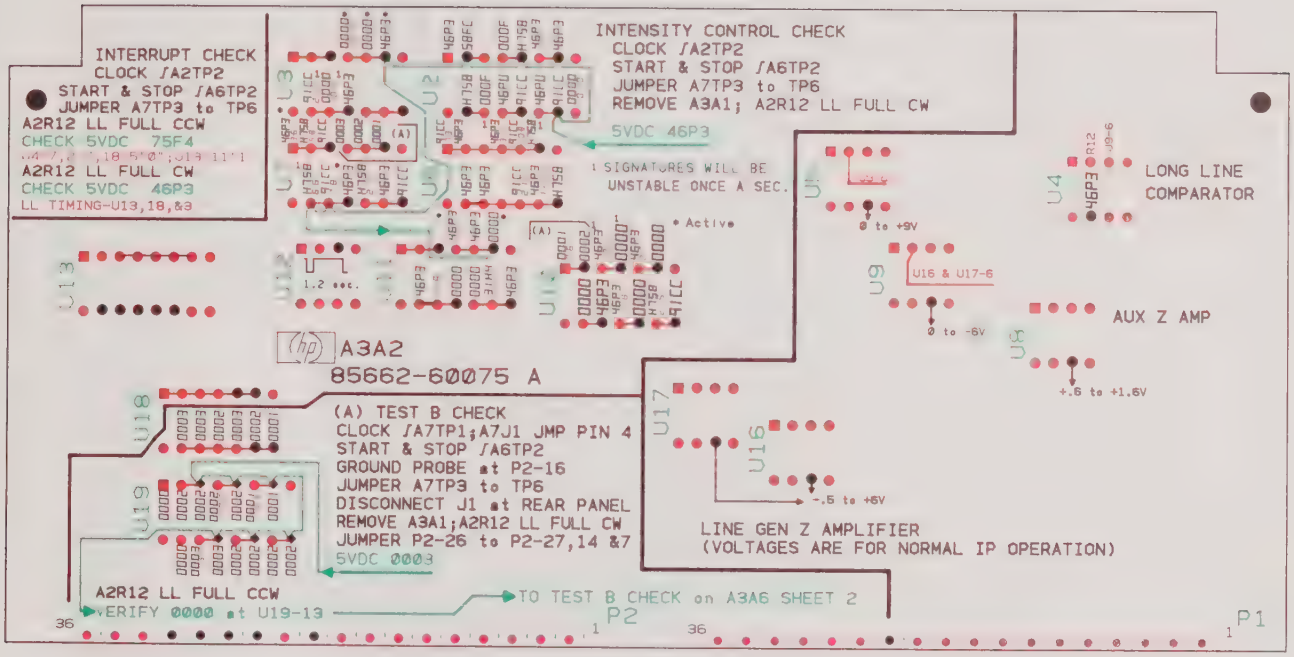


Figure 9-89. A3A2 Intensity Control, Signature Analysis Troubleshooting Diagram

A3A6 MAIN CONTROL, CIRCUIT DESCRIPTION (Service Sheet 19)

The Digital Storage Processor is controlled by an algorithmic state machine, which uses relative-state addressing and interrupt linkage in performing the control algorithm. The Digital Storage Processor includes A3A4 Memory, A3A5 Data Manipulator, A3A6 Main Control, and A3A7 Interface.

State Register (D)

The State Register, U13 and U14, contains the present state of the algorithm. The present state data is supplied to the Program ROM (Read-Only Memory), where it is decoded into control functions.

Branch Length Adder (A)

The Branch Length Adder, U1 and U2, receives branch length data from the Program ROM and adds it to the present state data to generate the next state.

Link Register (C)

The Link Register, U12 and U15, holds the suspended state of the main program during interrupts and holds the next interrupt state during the main program.

In effect the Link Register acts as a "bookmark" for both the main program and the interrupt program, so that each program can resume at the correct state.

State Machine Control (F)

The State Machine Control, U16, U17, U18, U27C, and U27D, manages switching between the main and interrupt programs. In addition, it generates a signal to increment the Branch Length Adder for conditional branching.

Program ROM (B)

The Program ROM, U4, U6, U8, and U10, contains both the main program and the interrupt program. U5, U7, U9, and U11 are test firmware used in Signature Analysis.

Pipeline Registers (E) (K)

The Pipeline Registers, U24 and U28, hold instructions from the Program ROM for 125 nsec during execution.

Addressable Flip-Flops (L)

U21 and U23 contain 16 flip-flops that may be individually set and cleared. These flip-flops control signals for the Input Section and CRT Driver Section of A3 Digital Storage. The Input Section includes A3A8 Analog-Digital Converter and A3A9 Track and Hold. The CRT Driver Section includes A3A1 Trigger, A3A2 Intensity Control, and A3A3 Line Generator. The flip-flops also control flags and memory control

lines for the Processor Section, which includes A3A4 Memory, A3A5 Data Manipulator, A3A6 Main Control, and A3A7 Interface. U19, U27A, and U27B decode instructions from Pipeline Register U28 to control the 16 flip flops. U29 contains buffers to output flag and timer signals onto the Digital Storage Bus.

Control Pulses (G)

U26 decodes eight control pulses based on the instruction in the Pipeline Register U24. U25A is a flip-flop that is set and cleared by the signals decoded by U26. U26 controls the reset of peak detectors in the Input Section of A3 Digital Storage.

Dual Timer (H)

U20 provides two timing pulses. One, about 20 msec, controls the CRT refresh rate. The other, about 20 μsec, is used in the digital peak detection algorithm.

RAM Chip Enable Generator (J)

U22 generates chip enable timing for A3A4 Memory. It delays execution of program instructions 1 1 2 states (182.5 nsec) to allow addresses to settle.

Table 9-16. A3A6 Main Control, Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A6	85662-60022	1	BOARD ASSEMBLY, MAIN CONTROL	28480	85662-60022
A3A6C1	0160-4084	12	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A6C2	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A6C3	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A6C4	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A6C5	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A6C6	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A6C7	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A6C8	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A6C9	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A6C10	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A6C11	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A6C12	0160-0573	1	CAPACITOR-FXD 4700PF +-20% 100VDC CER	28480	0160-0573
A3A6C13	0180-0197	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A3A6C14	0180-0228	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	150D226X9015B2
A3A6C15	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A6J1	1200-0507	1	SOCKET-IC 16-CONT DIP-SLDR	06776	0002811
A3A6J2	1460-1489	1	WIREFORM BE CU AG	28480	1460-1489
A3A6P1	1251-4787	1	SHUNT-DIP, 8 POS	28480	1251-4787
A3A6R1	0698-3155	3	RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A3A6R2	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A3A6R3	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A3A6R4	0698-3157	1	RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A3A6R5	0757-0442	1	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A6R6	0757-0401	1	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A3A6TP1	0360-0535	11	TERMINAL, TEST POINT	28480	0360-0535
A3A6TP2	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A6TP3	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A6TP4	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A6TP5	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A6TP6	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A6TP7	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A6TP8	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A6TP9	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A6TP10	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A6TP11	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A6U1	1820-1871	2	IC ADDR TTL S BIN FULL ADDR 4-BIT	0169M	SN748283N
A3A6U2	1820-1871		IC ADDR TTL S BIN FULL ADDR 4-BIT	0169M	SN748283N
A3A6U3	1810-0205	1	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0248C	750-81-R4.7K
A3A6U4	1816-1008	8	IC SN748472J 4K PROM TTL	0169M	SN748472J
A3A6U5	1816-1008		IC SN748472J 4K PROM TTL	0169M	SN748472J
A3A6U6	1816-1008		IC SN748472J 4K PROM TTL	0169M	SN748472J
A3A6U7	1816-1008		IC SN748472J 4K PROM TTL	0169M	SN748472J
A3A6U8	1816-1008		IC SN748472J 4K PROM TTL	0169M	SN748472J
A3A6U9	1816-1008		IC SN748472J 4K PROM TTL	0169M	SN748472J
A3A6U10	1816-1008		IC SN748472J 4K PROM TTL	0169M	SN748472J
A3A6U11	1816-1008		IC SN748472J 4K PROM TTL	0169M	SN748472J
A3A6U12	1820-1076	3	IC FF TTL S D-TYPE POS-EDGE-TRIG CLEAR	0169M	SN748174N
A3A6U13	1820-1981	3	IC RGTR TTL S QUAD 2-INP	0379D	AM25809PC
A3A6U14	1820-1981		IC RGTR TTL S QUAD 2-INP	0379D	AM25809PC
A3A6U15	1820-1076		IC FF TTL S D-TYPE POS-EDGE-TRIG CLEAR	0169M	SN748174N
A3A6U16	1820-1981		IC RGTR TTL S QUAD 2-INP	0379D	AM25809PC
A3A6U17	1820-0685	2	IC GATE TTL S NAND TPL 3-INP	0169M	SN74810N
A3A6U18	1820-0681	2	IC GATE TTL S NAND QUAD 2-INP	0223G	74S00PC
A3A6U19	1820-0685		IC GATE TTL S NAND TPL 3-INP	0169M	SN74810N
A3A6U20	1820-1423	1	IC MV TTL LS MONOSTBL RETRIG DUAL	0169M	SN74LS123N
A3A6U21	1820-1729	2	IC LCH TTL LS COM CLEAR 8-BIT	0169M	SN74LS259N
A3A6U22	1820-0693	1	IC FF TTL S D-TYPE POS-EDGE-TRIG	0223G	74S74PC
A3A6U23	1820-1729		IC LCH TTL LS COM CLEAR 8-BIT	0169M	SN74LS259N
A3A6U24	1820-1196	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS174N
A3A6U25	1820-1112	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG	0169M	SN74LS74N
A3A6U26	1820-1216	1	IC DCDR TTL LS 3-TO-8-LINE 3-INP	0379D	SN74LS138N
A3A6U27	1820-0681		IC GATE TTL S NAND QUAD 2-INP	0223G	74S00PC
A3A6U28	1820-1076		IC FF TTL S D-TYPE POS-EDGE-TRIG CLEAR	0169M	SN748174N
A3A6U29	1820-1491	1	IC BFR TTL LS NON-INV HEX 1-INP	0169M	SN74LS367N
			A3A6 MISCELLANEOUS PARTS		
	1480-0073	1	PIN:DRIVE 0.250" LG	28480	1480-0073
	4040-0754	1	EXTRACTOR-PC BOARD BLU POLYC	28480	4040-0754

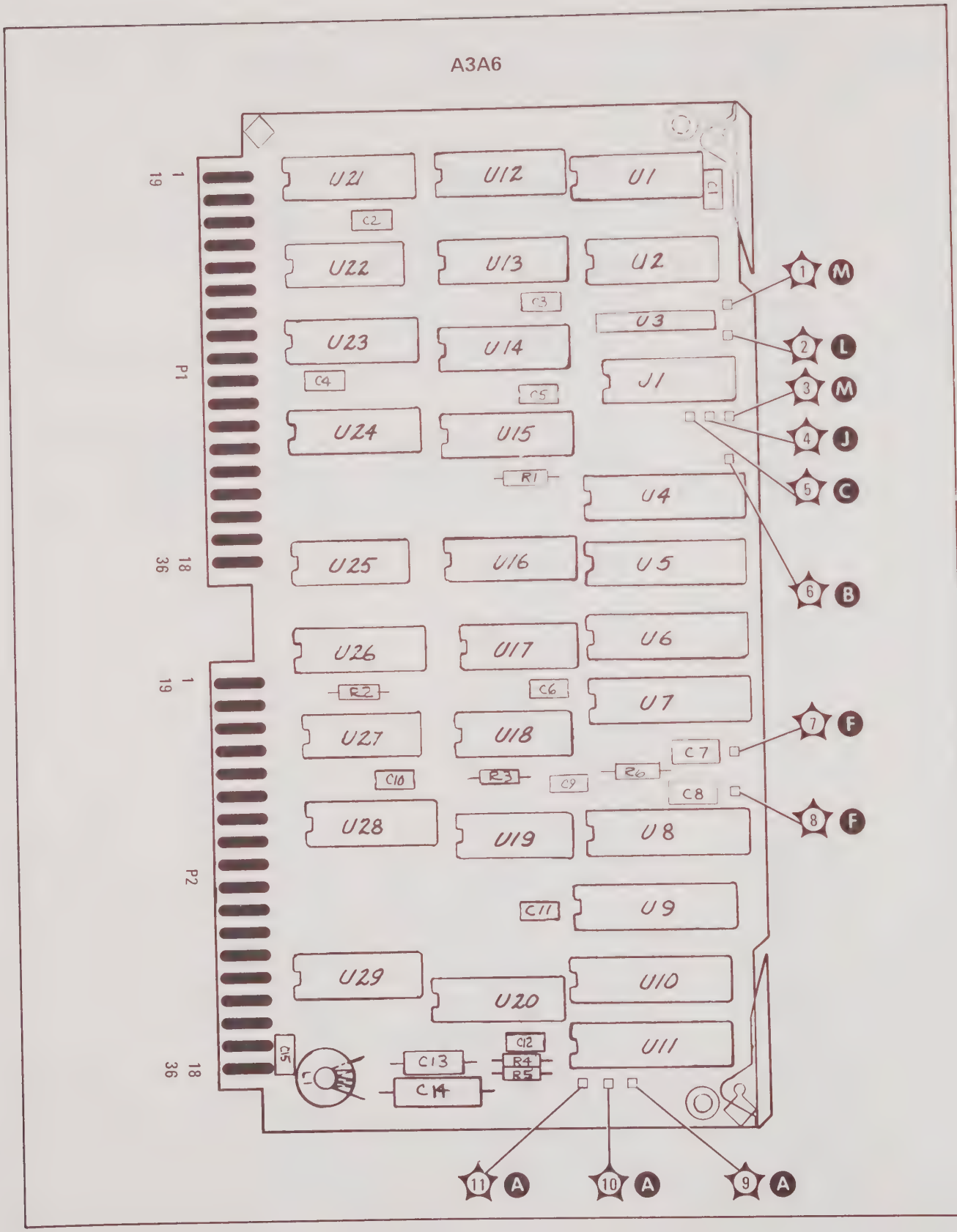


Figure 9-92. A3A6 Main Control, Component Locations

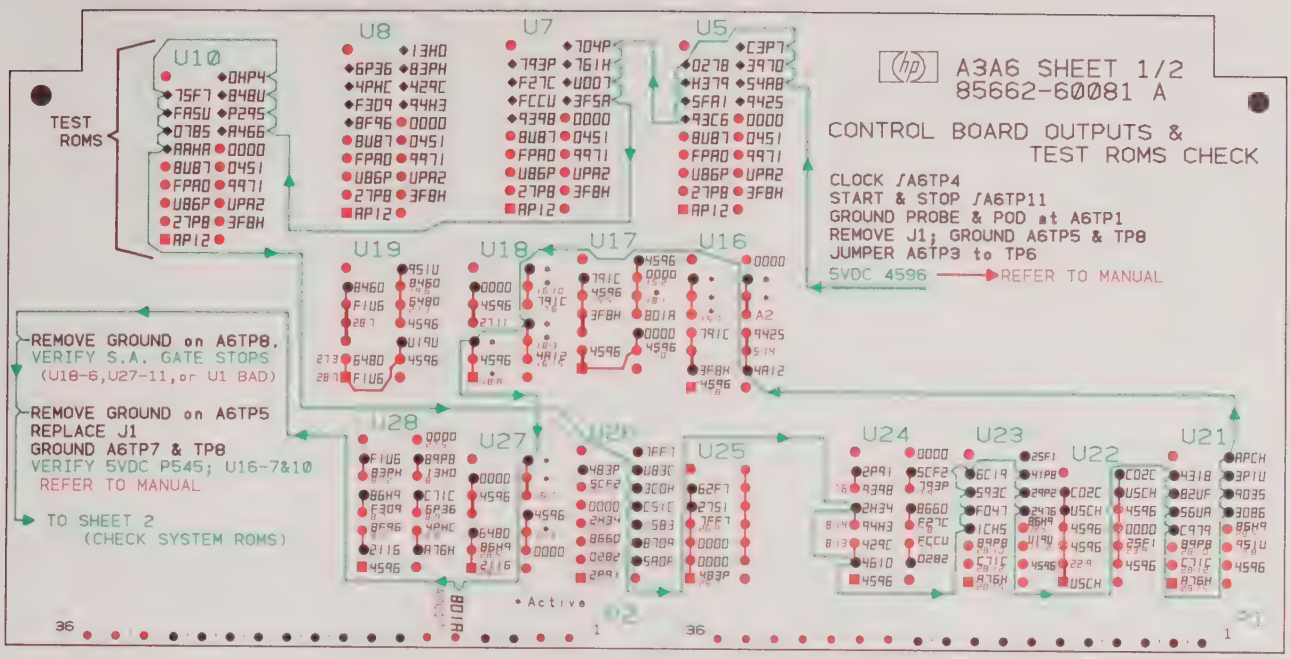


Figure 9-93. A3A6 Main Control, Signature Analysis Troubleshooting Diagram (1 of 2)

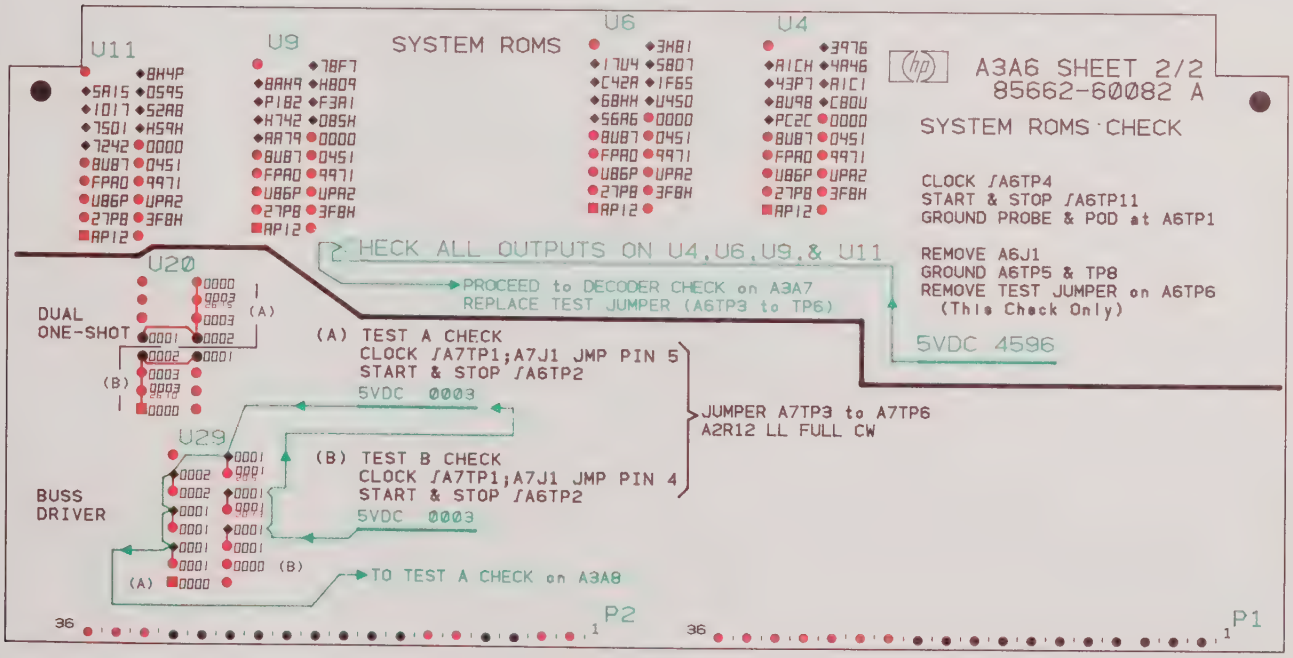


Figure 9-93. A3A6 Main Control, Signature Analysis Troubleshooting Diagram (2 of 2)

A3A5 DATA MANIPULATOR, CIRCUIT DESCRIPTION (Service Sheet 20)

A3A5 Data Manipulator contains 16 random-access memory (RAM) registers and 32 read-only memory (ROM) registers, an accumulator, and an arithmetic logic unit (ALU). This assembly provides all data functions and transfers for digital storage.

Register RAM (B)

U13, U15, U17 form the 16 12-bit RAM registers used for data storage during data manipulation.

Constant ROM (F)

U1 and U18 form the 16 12-bit ROM registers used as constants for data storage during data manipulation.

Accumulator (D)

U7 and U9 form the 12-bit Accumulator, which receives and holds all results of ALU operations.

Buffer (C)

U5 and U11 are three-state data buffers that allow the Accumulator data to be transferred to the Source Bus.

Arithmetic Logic Unit (ALU) (E)

U2, U3, and U4 are the main Arithmetic Logic Unit (ALU). U16 provides high-speed carry look-ahead. U14 decodes ALU outputs to determine whether a zero-value result has been generated.

Pipeline Register (G)

U12 and U24 form an instruction Pipeline Register for data manipulation instructions.

Control Decoder (H)

U19 through U23 decode data manipulation instructions into the necessary control lines.

Muliplexer/Bus Driver (A)

U6, U8, and U10 form a 12-bit Bus Driver with two data inputs. Data from the RAM Bus or from the Accumulator Bus may be transferred to the main Digital Storage Bus through these drivers.

Table 9-17. A3A5 Data Manipulator, Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A5	85662-60024	1	BOARD ASSEMBLY, DATA MANIPULATOR	28480	85662-60024
A3A5C1	0160-4084	11	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A5C2	0180-0228	2	CAPACITOR-FXD 22UF +-10% 15VDC TA	04200	150D226X9015B2
A3A5C3	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A5C4	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A5C5	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A5C6	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A5C7	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A5C8	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A5C9	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A5C10	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A5C11	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A5C12	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A5C13	0180-0228		CAPACITOR-FXD 22UF +-10% 15VDC TA	04200	150D226X9015B2
A3A5L1	08556-80011	1	FILTER, COIL, BLUE	28480	08556-80011
A3A5R1	0698-3155	16	RESISTOR 4.64K 1% .125W F TC=0+-100	03888	C4-1/8-T0-4641-F
A3A5R2	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03888	C4-1/8-T0-4641-F
A3A5R3	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03888	C4-1/8-T0-4641-F
A3A5R4	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03888	C4-1/8-T0-4641-F
A3A5R5	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03888	C4-1/8-T0-4641-F
A3A5R6	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03888	C4-1/8-T0-4641-F
A3A5R7	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03888	C4-1/8-T0-4641-F
A3A5R8	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03888	C4-1/8-T0-4641-F
A3A5R9	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03888	C4-1/8-T0-4641-F
A3A5R10	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03888	C4-1/8-T0-4641-F
A3A5R11	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03888	C4-1/8-T0-4641-F
A3A5R12	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03888	C4-1/8-T0-4641-F
A3A5R13	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03888	C4-1/8-T0-4641-F
A3A5R14	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03888	C4-1/8-T0-4641-F
A3A5R15	0698-3132	2	RESISTOR 261 1% .125W F TC=0+-100	03888	C4-1/8-T0-2610-F
A3A5R16	0698-3132		RESISTOR 261 1% .125W F TC=0+-100	03888	C4-1/8-T0-2610-F
A3A5TP1	0360-0535	4	TERMINAL, TEST POINT	[illegible]	[illegible]
A3A5TP2	0360-0535		TERMINAL, TEST POINT	[illegible]	[illegible]
A3A5TP3	0360-0535		TERMINAL, TEST POINT	[illegible]	[illegible]
A3A5TP4	0360-0535		TERMINAL, TEST POINT	[illegible]	[illegible]
A3A5U1					
A3A5U2	1820-1074	3	IC ARITH-LOGIC-UN TTL S	01698	SN74S181J
A3A5U3	1820-1074		IC ARITH-LOGIC-UN TTL S	01698	SN74S181J
A3A5U4	1820-1074		IC ARITH-LOGIC-UN TTL S	01698	SN74S181J
A3A5U5	1820-1401	2	IC BFR TTL LS NON-INV HEX 1-INP	01698	SN74LS367N
A3A5U6	1820-1439	3	IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE	01698	SN74LS258N
A3A5U7	1820-1196	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	03790	AM74LS174N
A3A5U8	1820-1439		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE	01698	SN74LS258N
A3A5U9	1820-1196		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	03790	AM74LS174N
A3A5U10	1820-1439		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE	01698	SN74LS258N
A3A5U11	1820-1401		IC BFR TTL LS NON-INV HEX 1-INP	01698	SN74LS367N
A3A5U12	1820-1076	1	IC FF TTL S D-TYPE POS-EDGE-TRIG CLEAR	01698	SN74S174N
A3A5U13	1816-0724	3	IC SN74S189N 64-BIT RAM TTL	03790	AM74S189
A3A5U14	1820-1130	1	IC GATE TTL S NAND 13-INP	01698	SN74S133N
A3A5U15	1816-0724		IC SN74S189N 64-BIT RAM TTL	03790	AM74S189
A3A5U16	1820-1305	1	IC GEN TTL S LOOK-AHD-CRY	01698	SN74S182N
A3A5U17	1816-0724		IC SN74S189N 64-BIT RAM TTL	03790	AM74S189
A3A5U18					
A3A5U19	1820-0681	1	IC GATE TTL S NAND QUAD 2-INP	02235	74S00PC
A3A5U20	1820-0685	1	IC GATE TTL S NAND TPL 3-INP	01698	SN74S10N
A3A5U21	1820-1202	1	IC GATE TTL LS NAND TPL 3-INP	02235	9LS10PC
A3A5U22	1820-1197	1	IC GATE TTL LS NAND QUAD 2-INP	01698	SN74LS00N
A3A5U23	1820-1287	1	IC BFR TTL LS NAND QUAD 2-INP	01698	SN74LS37N
A3A5U24	1820-1195	1	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	03790	AM74LS175A
			A3A5 MISCELLANEOUS PARTS		
	1480-0073	1	PINDRIVE 0.250" LG	[illegible]	[illegible]
	4040-0753	1	EXTRACTOR-PC BOARD GRN POLYC	28480	4040-0753

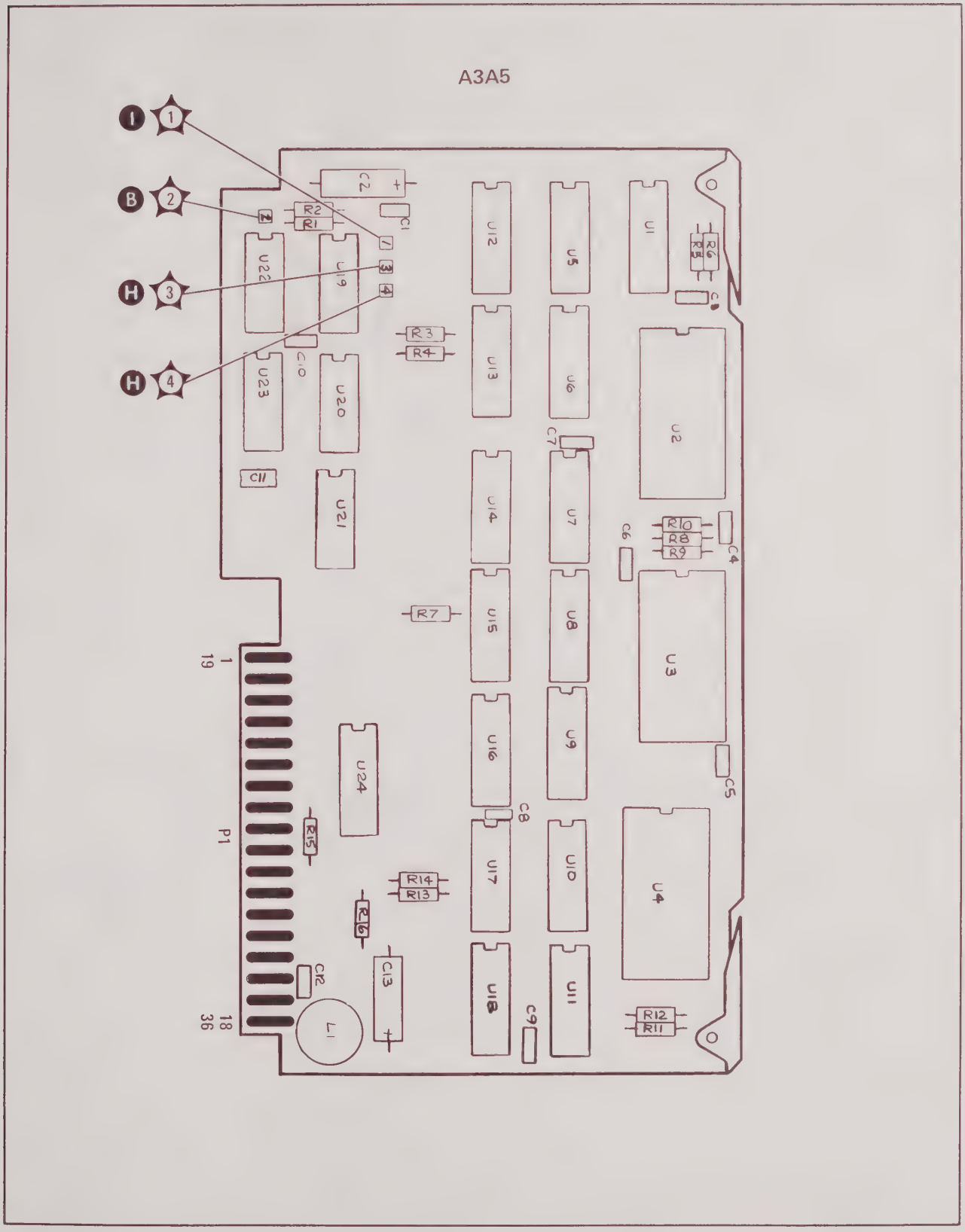


Figure 9-96. A3A5 Data Manipulator, Component Locations

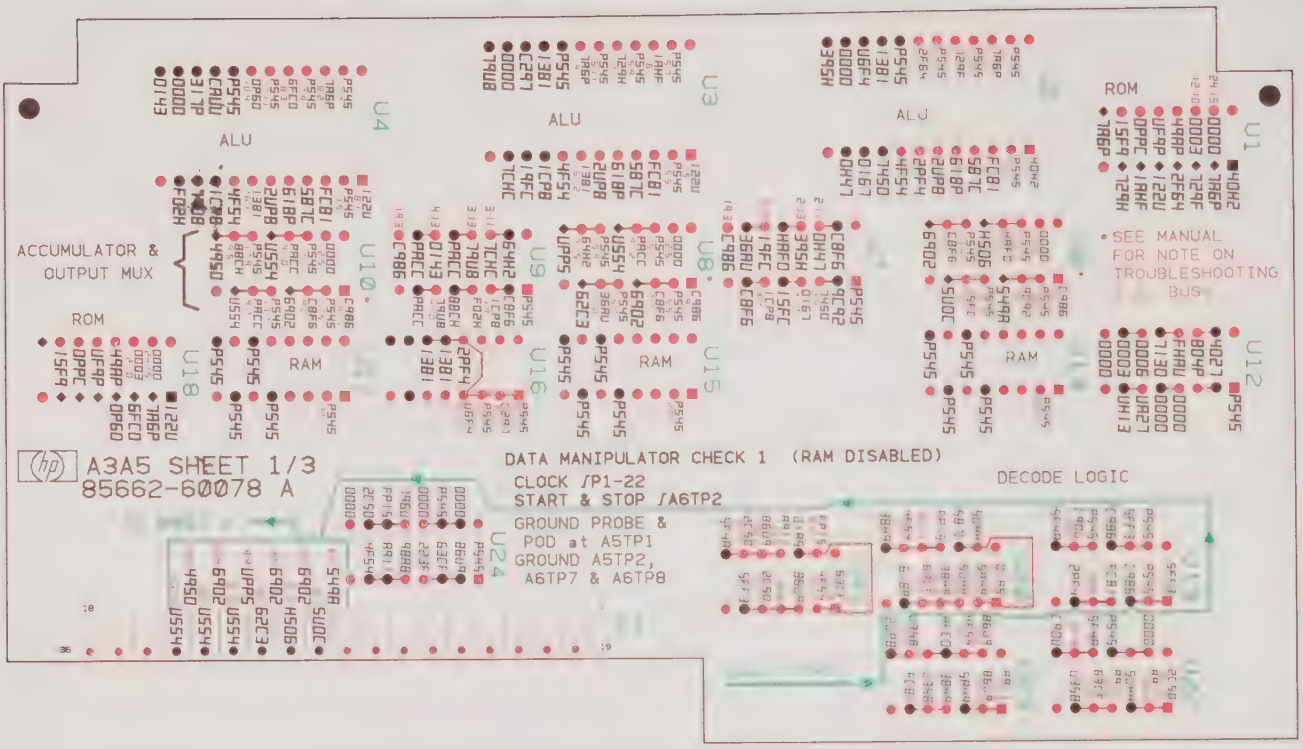


Figure 9-97. A3A5 Data Manipulator, Signature Analysis Troubleshooting Diagram (1 of 3)

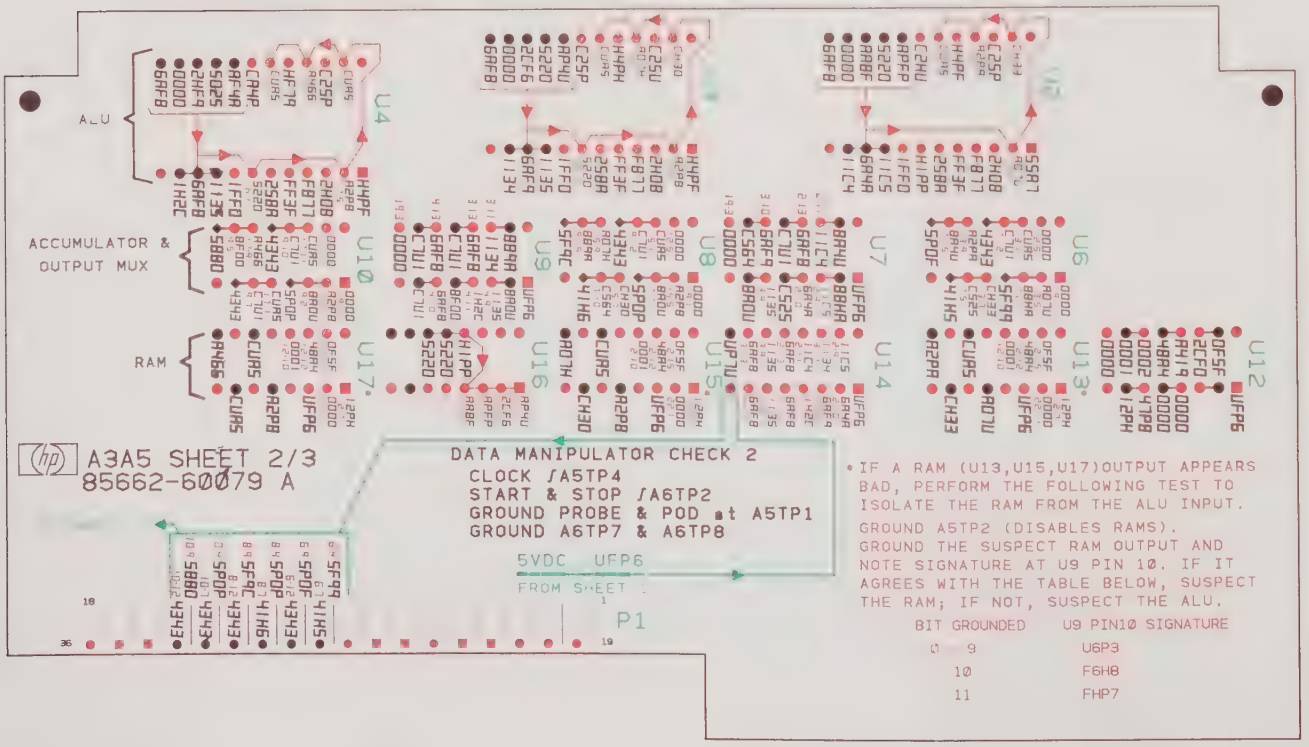

ALU
ACCUMULATOR & OUTPUT MUX
RAM
A3A5 SHEET 2/3
85662-60079 A
DATA MANIPULATOR CHECK 2
CLOCK ƒA5TP4
START & STOP ƒA6TP2
GROUND PROBE & POD at A5TP1
GROUND A6TP7 & A6TP8
5VDC UFP6
FROM SHEET 1
P1
• IF A RAM (U13,U15,U17)OUTPUT APPEARS BAD, PERFORM THE FOLLOWING TEST TO ISOLATE THE RAM FROM THE ALU INPUT.
GROUND A5TP2 (DISABLES RAMS).
GROUND THE SUSPECT RAM OUTPUT AND NOTE SIGNATURE AT U9 PIN 10. IF IT AGREES WITH THE TABLE BELOW, SUSPECT THE RAM; IF NOT, SUSPECT THE ALU.
BIT GROUNDED
U9 PIN10 SIGNATURE
9 U6P3
10 F6H8
11 FHP7

Figure 9-97. A3A5 Data Manipulator, Signature Analysis Troubleshooting Diagram (2 of 3)

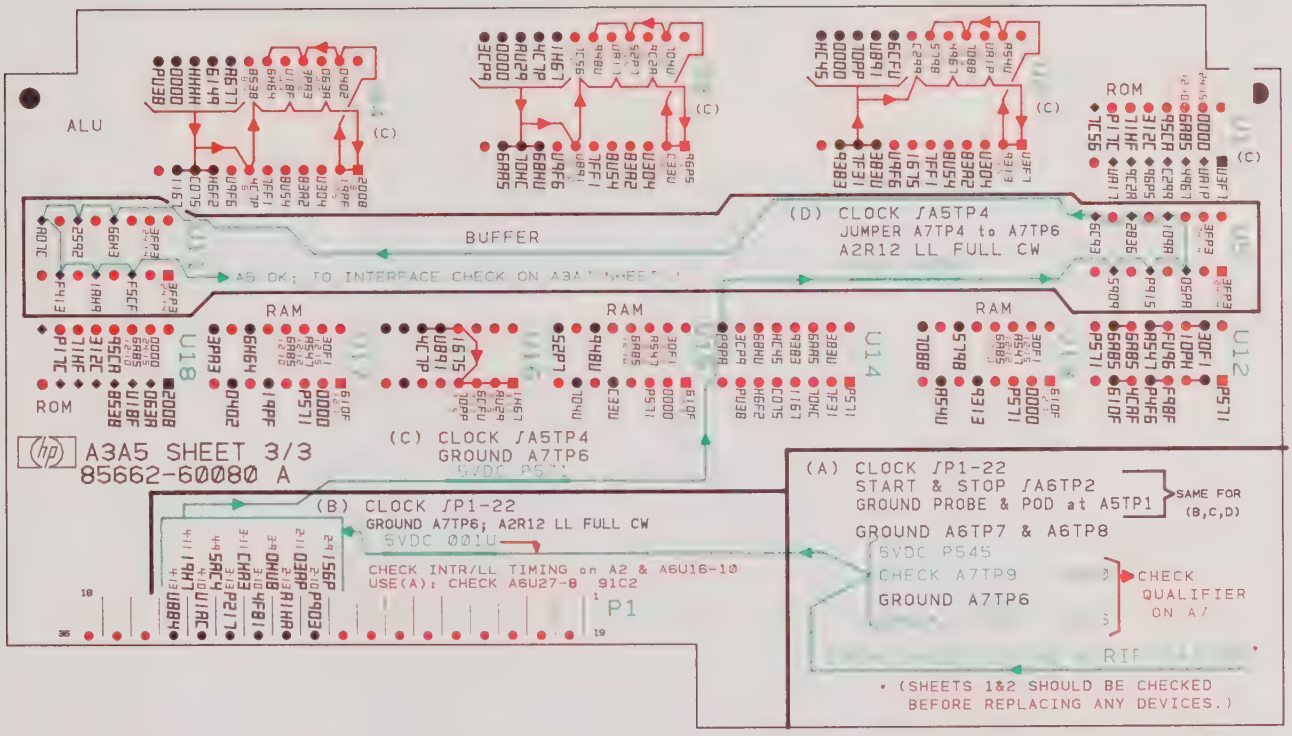


Figure 9-97. A3A5 Data Manipulator, Signature Analysis Troubleshooting Diagram (3 of 3)

A3A7 INTERFACE, CIRCUIT DESCRIPTION (Service Sheet 21)

A3A7 Interface provides data transfer between A15 Processor and A3 Digital Storage. This assembly also includes qualifier selection for conditional branching, input/output (I/O) port decoding, and the main clock circuits.

Data Transfer Register (A)

U1, U3, U4, and U8 form a 16-bit Data Transfer Register which can be loaded or output onto either the Instrument Bus (through U6 and U7, the Instrument Bus Drivers) or the Digital Storage Bus (through U2, U5, and U9, the Digital Storage Bus Drivers).

Instrument Address Decoder (C)

U11, U12, and U13 control the loading and output of data betwen the Data Transfer Register and the Instrument Bus.

Qualifier Select (H)

U14 and U15 select one of 16 qualifiers to be used for conditional branching. Selection is controlled by A3A6 Main Control firmware.

I/O Port Decoder (D)

U16 and U17 decode I/O port control signals from the Pipeline Registers in A3A6 Main Control.

Timing Generator (G)

U10, U18, U20 and U21 generate 8-MHz, 1-MHz, and 200-kHz timing signals used by A3 Digital Storage.

Table 9-18. A3A7 Interface, Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A7	85662-60021	1	BOARD ASSEMBLY, INTERFACE	28480	85662-60021
A3A7C1	0160-4084	12	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A7C2	0180-0228	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	150D226X9015B2
A3A7C3	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A7C4	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A7C5	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A7C6	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A7C7	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A7C8	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A7C9	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A7C10	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A7C11	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A7C12	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A7C13	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A7C14	0160-2264	1	CAPACITOR-FXD 20PF +-5% 500VDC CER0+-30	28480	0160-2264
A3A7CR1	1902-3036	1	DIODE-ZNR 3.16V 5% DO-7 PD=.4W TC=-.064%	0203G	BZ 10939-38
A3A7CR2	1901-0535	1	DIODE-SCHOTTKY	28480	1901-0535
A3A7E1	1460-1489	1	SPRING, WIREFORM (TEST JUMPER)	28480	1460-1489
A3A7J1					
A3A7L1	08558-80011	1	FILTER, COIL, BLUE	28480	08558-80011
A3A7Q1	1854-0404	1	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A7R1	0698-7232	2	RESISTOR 681 1% .05W F TC=0+-100	03298	C3-1/8-T0-681R-G
A3A7R2	0698-7242	6	RESISTOR 1.78K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1781-G
A3A7R3	0698-7232		RESISTOR 681 1% .05W F TC=0+-100	03298	C3-1/8-T0-681R-G
A3A7R4	0698-7242		RESISTOR 1.78K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1781-G
A3A7R5	0698-7242		RESISTOR 1.78K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1781-G
A3A7R6	0698-7242		RESISTOR 1.78K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1781-G
A3A7R7	0698-7242		RESISTOR 1.78K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1781-G
A3A7R8	0698-7228	1	RESISTOR 464 1% .05W F TC=0+-100	03298	C3-1/8-T0-464R-G
A3A7R9	0698-7242		RESISTOR 1.78K 1% .05W F TC=0+-100	03298	C3-1/8-T0-1781-G
A3A7S1	3101-2170	1	SWITCH, PUSHBUTTON SPDT MOM	28480	3101-2170
A3A7TP1	0360-0535	10	TERMINAL, TEST POINT	28480	0360-0535
A3A7TP2	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A7TP3	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A7TP4	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A7TP5	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A7TP6	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A7TP7	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A7TP8	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A7TP9	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A7TP10	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A3A7U1	1820-1444	4	IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	0169M	SN74LS298N
A3A7U2	1820-1491	5	IC BFR TTL LS NON-INV HEX 1-INP	0169M	SN74LS367N
A3A7U3	1820-1444		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	0169M	SN74LS298N
A3A7U4	1820-1444		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	0169M	SN74LS298N
A3A7U5	1820-1491		IC BFR TTL LS NON-INV HEX 1-INP	0169M	SN74LS367N
A3A7U6	1820-1491		IC BFR TTL LS NON-INV HEX 1-INP	0169M	SN74LS367N
A3A7U7	1820-1491		IC BFR TTL LS NON-INV HEX 1-INP	0169M	SN74LS367N
A3A7U8	1820-1444		IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	0169M	SN74LS298N
A3A7U9	1820-1491		IC BFR TTL LS NON-INV HEX 1-INP	0169M	SN74LS367N
A3A7U10	1820-1199	1	IC INV TTL LS HEX 1-INP	0169M	SN74LS04N
A3A7U11	1820-1202	2	IC GATE TTL LS NAND TPL 3-INP	02238	9L810PC
A3A7U12	1820-1202		IC GATE TTL LS NAND TPL 3-INP	02238	9L810PC
A3A7U13	1820-1416	1	IC SCHMITT-TRIG TTL LS INV HEX 1-INP	0169M	SN74LS14N
A3A7U14	1820-1980	2	IC MUXR/DATA-SEL TTL S 8-INP	0291J	N828318
A3A7U15	1820-1980		IC MUXR/DATA-SEL TTL S 8-INP	0291J	N828318
A3A7U16	1820-1240	2	IC DCDR TTL S 3-TO-8-LINE 3-INP	0169M	SN748138N
A3A7U17	1820-1240		IC DCDR TTL S 3-TO-8-LINE 3-INP	0169M	SN748138N
A3A7U18	1820-0693	1	IC FF TTL S D-TYPE POS-EDGE-TRIG	02238	74S74PC
A3A7U19	1810-0206	1	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	0374D	4308R-101-1038
A3A7U20	1820-1431	1	IC CNTR TTL LS DECD SYNCHRO	0169M	SN74LS162N
A3A7U21	1820-1432	1	IC CNTR TTL LS BIN SYNCHRO POS-EDGE-TRIG	0169M	SN74LS163N
A3A7Y1	0410-1034	1	CRYSTAL, 16.00 MHZ	28480	0410-1034
			A3A7 MISCELLANEOUS PARTS		
	1480-0073	1	PINDRIVE 0.250" LG	28480	1480-0073
	4040-0755	1	EXTRACTOR-PC BOARD VIO POLYC	28480	4040-0755

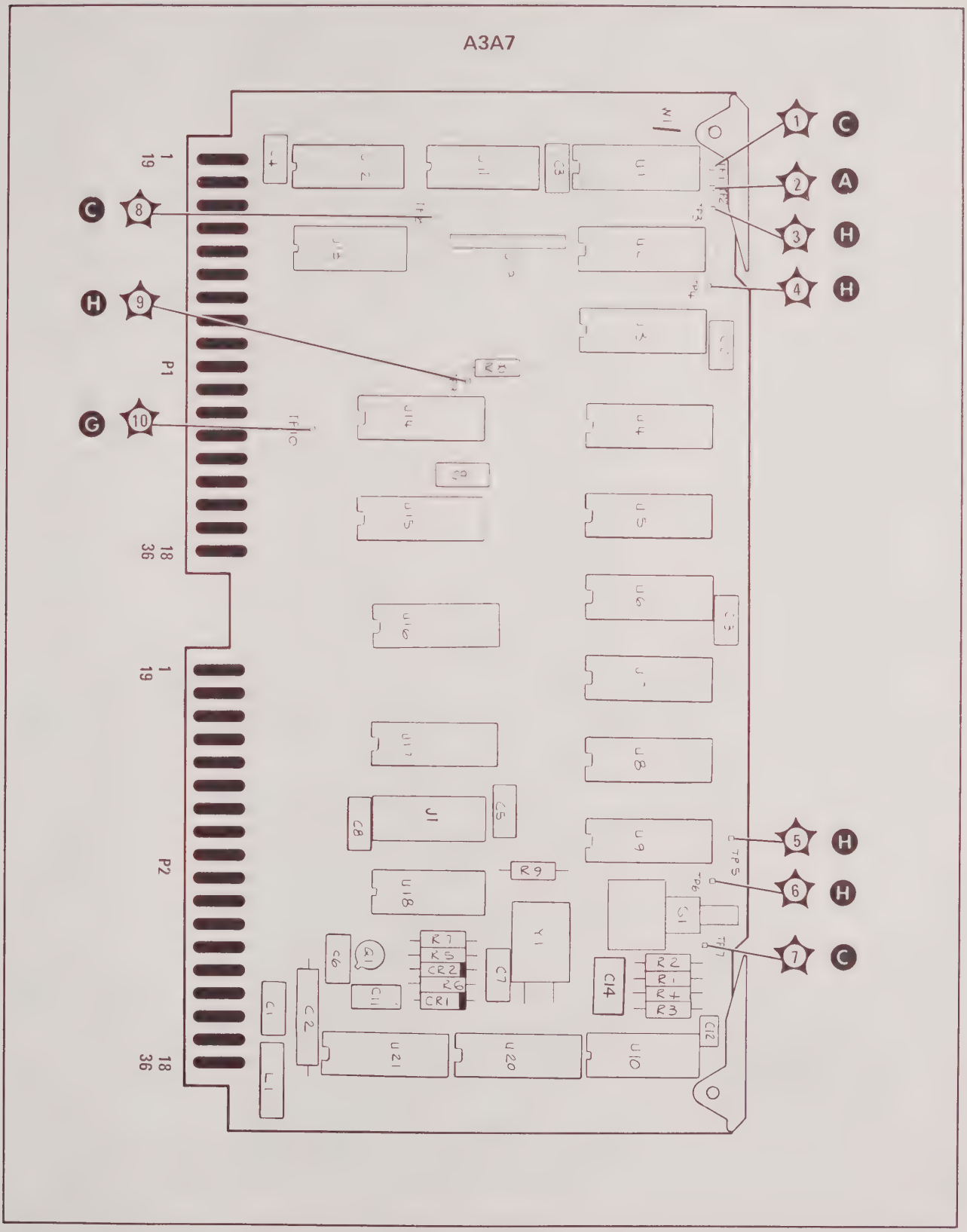


Figure 9-100. A3A7 Interface, Component Locations

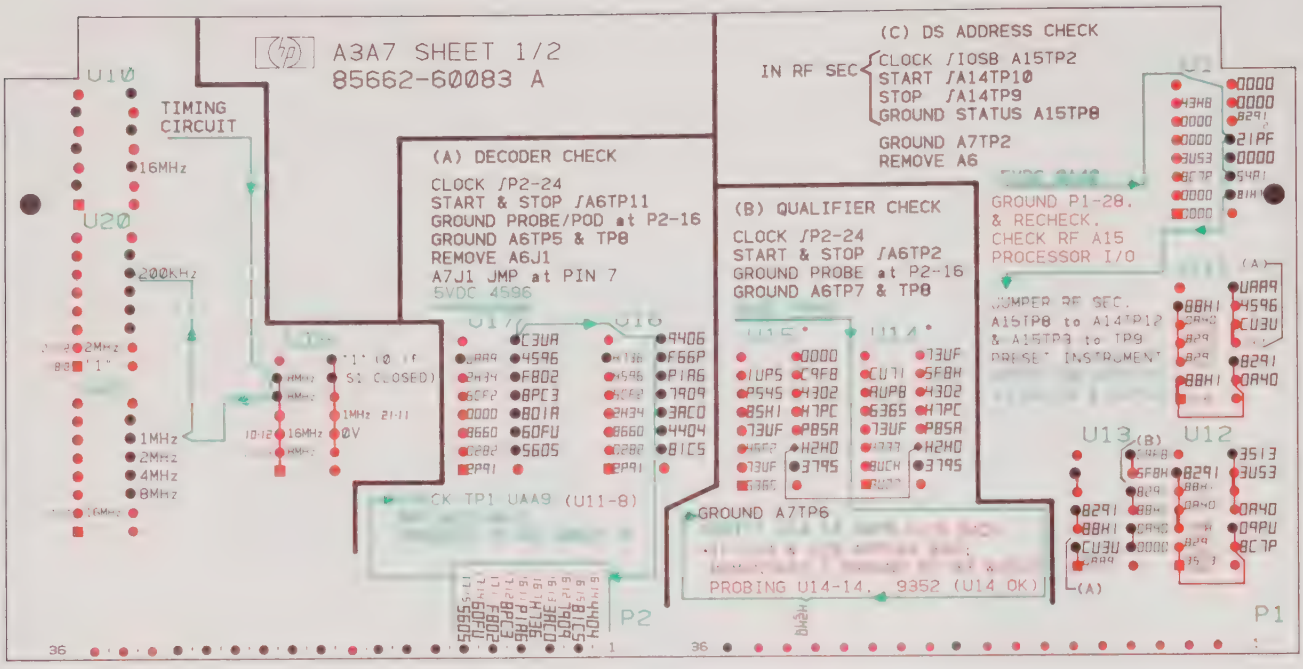


Figure 9-101. A3A7 Interface, Signature Analysis Troubleshooting Diagram (1 of 2)

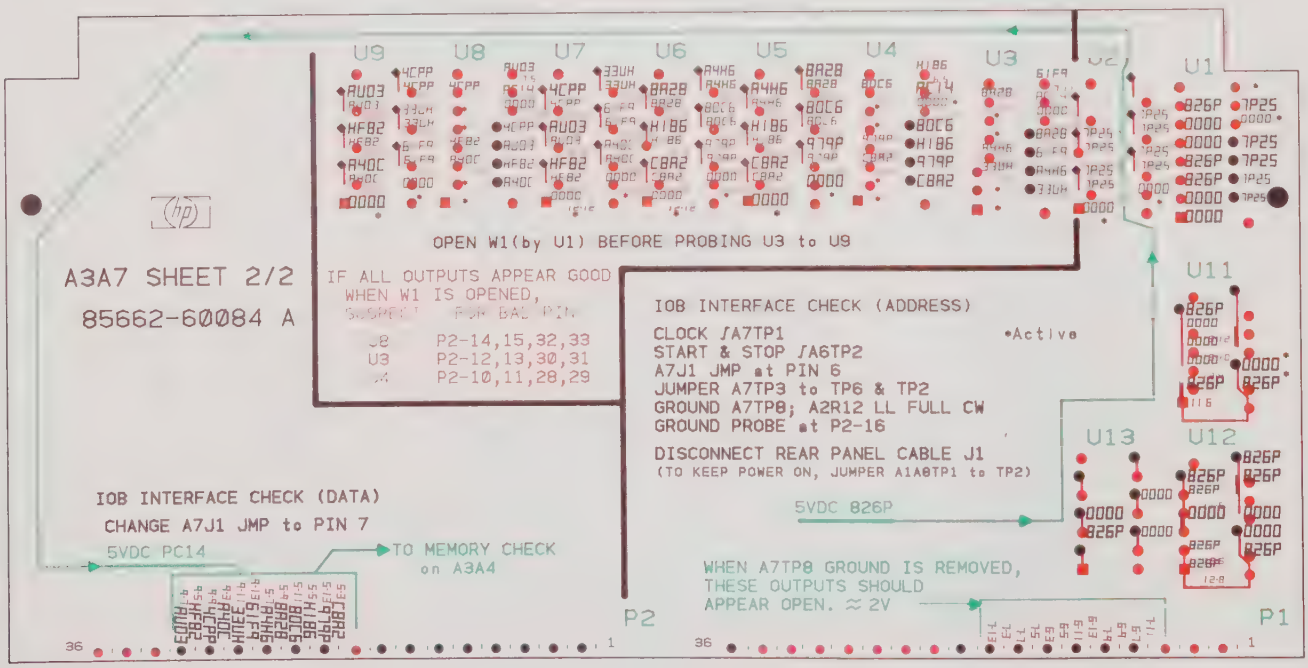


Figure 9-101. A3A7 Interface, Signature Analysis Troubleshooting Diagram (2 of 2)

A3A1 TRIGGER, CIRCUIT DESCRIPTION (Service Sheet 22)

A3A1 Trigger contains circuits which generate the HSWP signal to A3 Digital Storage, A12 RF Section Interface, A15 Processor, and A22 Frequency Control. Instrument Bus commands set the HSWP line high or low, or program HSWP to go high when a sweep trigger occurs. Trigger sources that may be selected are: the AC line, the video signal, or an external trigger input to the rear panel. A3A1 contains circuits that select and process trigger signals. It also contains the Fast Sweep Generator, which produces a linear ramp voltage (0 V to approximately +2.2V) used as a horizontal sweep for the CRT display. This sweep ramp is used only with FREQUENCY SPAN = 0 Hz. (it is not used to sweep the RF Section frequency).

The fast sweep ramp is applied to A1A4 X Deflection Amplifier when selected by an analog multiplexer in A3A2 Intensity Control. The fast sweep time may be varied in a 1, 2, 5 sequence from 10 msec (1 msec/div) to 1 μsec (100 nsec/div). Trigger circuitry used for the triggering of RF Section sweeps (by HSWP) is used to trigger fast sweeps.

A3A1 also contains the Recorder Penlift Driver circuit, which is part of the High Sweep Control.

High Sweep Control (B)

The High Sweep Control circuit generates HSWP, which is a TTL open-collector signal that is used by A3 Digital Storage to control signal tracking and converison. HSWP is also used by A22 Frequency Control to control the Sweep Generator in that assembly. The sweep generated in A22 is in progress when HSWP is high and is stopped (at any point during the sweep) when HSWP is low. Several assemblies in the RF Section pull HSWP low to stop the RF Section sweep under certain conditions. For example, when a front-panel key is pressed, A15 Processor pulls HSWP low to immediately stop the sweep, then programs HSWP low with an Instrument Bus command before servicing the front-panel request. HSWP must be set high again for the sweep in the RF Section to resume.

HSWP Generation. For HSWP to be high, flip-flop U12A pin 6 must be low. Inverter U7A buffers U12A and provides the open collector drive for the HSWP line. U12A is set and cleared by the Instrument Bus and can be cleared by the RSHS signal from A3 Digital Storage. To set HSWP, Instrument Bus bits 14 and 15 are set high, Address 50 is selected, and address decoder U18 is enabled by LTIO, the IF-Display Section address strobe. U18, pin 13 goes low, which clocks the U4A and U4B Q outputs high. The positive-going transition at the U4B output triggers a pulse of approximately 500 μsec at U9A pin 4. At the end of this pulse, U9B generates a narrow (50-nsec) pulse that clocks U12A and U12B. This causes U12A pin 6 to go low and HSWP to go high. (Note that HSWP is et high approximately 500 μsec after occurrence of the Instrument Bus SET command. This time dealy allows A15 Processor to stop running before the sweep starts.

To clear HSWP, Instrument Bus bit 13 is set high, Address 50 is selected, and (when the IF-Display Section address strobe occurs) U12A, U12B, U4A, and U4B are cleared. HSWP may also be cleared by A3 Digital Storage when the RSHS line goes low.

Free Run Mode (Sweep Time ≥ 20 mSec). When the RF Section is in Free Run mode with sweep time ≥ 20 msec, the sweep is started when the Instrument Bus sets HSWP. The sweep is stopped by the RSHS line from A3 Digital Storage or by a CLEAR command from the Instrument Bus. A15 Processor controls the time from the end of one sweep to the beginning of the next sweep (sweep dead time).
time).

Line, Video, and External Triggers (Sweep Time ≥ 20 mSec). The RF Section can direct A3A1 to set HSWP high when a line, video, or external trigger occurs. If Instrument Bus line 14 is high and U18 is strobed with Address 50, U18 pin 13 will go low, setting U4A pin 9 high, which triggers U9A. At the end of the pulse generated by U9B, U12B pin 9 will be clocked high, placing a high at the date input (pin 2) U12A. The output (pin 6) of trigger multiplexer U16 in the Trigger Generator will then cause U12A to be clocked on a negative-going transition of the selected trigger input. (Refer to the Trigger Generator circuit description.)

Recorder Pen Lift Driver. In sweep times ≥ 20 msec, the Recorder Pen Lift Driver supplies the PEN LIFT signal to the rear-panel PENLIFT connector. PENLIFT May also be used to control blanking of an external CRT display.

PENLIFT is a 0V to 15V signal that lowers the recorder pen when an RF Section sweep is in progress (HSWP is high, PENLIFT is 0V) and lifts the pen when a sweep is not in progress (HSWP is low, PENLIFT is 15V). Decoder U3A is a non-inverting buffer that drives Q15 from the HSWP line.

Sweep Trigger (F)

The Sweep Trigger circuit produces triggers for all sweep times. It contains the video, external, and line trigger circuits, the fast sweep Free Run Oscillator, the trigger multiplexer, and the fast-sweep Auto Trigger circuit. A valid trigger for the Fast Sweep Generator or the High Sweep Control circuit is produced by a negative-going transition at the selected input of trigger multiplexer U16. This trigger signal will start a sweep only if the Fast Sweep Control and High Sweep Control circuits are in the proper states.

Video Trigger. Video Trigger Comparator U13 generates a negative-going transition when the VIDEO signal rises above the voltage at U13 pin 2, which depends on the position of the front-panel TRIGGER LEVEL control. R49, R50, and R51 divide the TRIG LEVEL voltage (0V to +5.1 V) to approximately −0.1V to +2.1V at U13 pin 2. The LOW FAST SWEEP line, connected to the strobe inputs (pins 5 and 6) of U13, disables the output of U13 in Fast Sweep mode when the fast sweep ramp is being generated. R52 provides hysteresis for U13, and CR1 protects U13 from excessive input voltage on the VIDEO line. The +10V and −10V supply voltages for U13 are derived through VR4 and VR5.

External and Line Triggers. The EXT TRIG input from the IF-Display Section rear panel is applied to buffer/inverter Q14 through divider R61 and R62. When EXT TRIG rises above approximately +1.4V, Q14 saturates and U15C pin 9 goes low, causing U16 pin 3 to go low, producing a trigger.

A voltage, resistively divided from a winding of the IF—Display line transformer, is buffered by Schmidt trigger inverter U15A, the output of which is applied to U16 Pin 2, the line trigger input of the trigger multiplexer. Negative-going transitions at U16 pin 2 are valid line triggers.

Free Run Mode (Sweep Time ⩽ 10 mSec). In Fast Sweep mode, during the fast sweep dead time, U11C pin 8 is high. This causes U15B to oscillate at a rate (determined by R59 an C11) of approximately 500 kHz. Negative-going transitions at U15B pin 6 produce triggers in Free run, Fast Sweep mode. U15B is gated off during the fast sweep ramp. Note that the Free Run Oscillator is not used to trigger sweeps in sweep times ≥20 msec. (See High Sweep Control circuit description.)

Fast Sweep Auto Trigger. When the EXT or VIDEO key is pressed and the sweep time is 10 msec or less (Fast Sweep mode), a fast sweep ramp will be started automatically about 25 msec after the start of the last fast sweep if no video or external trigger occurs first. If SHIFT EXT or SHIFT VIDEO keys are pressed, fast sweep triggering will be in Normal mode. In Normal mode, no fast sweep will be started until a trigger occurs. The CRT graticule and characters will not be refreshed until a fast sweep has occurred.

Auto Trigger Circuitry. In Auto Trigger mode, the instrument Bus sets U5 pin 12 High. U1A pin 1 goes high when the fast sweep ramp begins, triggering a 25-msec (low) pulse at U1A pin 4. If another fast sweep ramp is started within 25 msec of the beginning of the previous fast sweep ramp, U1A will be re-triggered, and U1A pin 4 will not go high for at least another 25 msec. If triggers cease to occur, U11D pin 11 will go high 25 msec after the last fast sweep. This causes trigger multiplexer U16 to select the output of the Free Run Oscillator in either Video or External mode, triggering a sweep. Auto triggering will not occur in sweep times ≥20 msec, because in this case the Auto Trigger circuitry is disabled by the FAST SWEEP ENABLE line to U11B pin 5.

If SHIFT EXT or SHIFT VIDEO keys are pressed, U5 Pin 12 will be low, preventing automatic triggering in the absence of a video or external trigger.

Fast Sweep Time Control (A)

Data on Instrument Bus lines 11 through 14 specify the fast sweep generator sweep time. This data is latched into hex D flip-flop U6 when Address 51 is strobed. (Refer to the table, Note 6 on the schematic, for coding of the sweep time control lines.) Data on Instrument Bus line 15 is latched into U6 with the four sweep time bits (11 — 14) and enables fast sweep generator operation.

Switchable Current Source. Current for the generation of the fast sweep ramp is supplied by Q13.Op amp U8 regulates (through R6 and R7) the emitter voltage of Q13 to keep it equal to the reference voltage at U8 pin 3.

Q6 controls the reference voltage by switching R2 in or out of the voltage divider circuit, which is made up of R1, R2, an R3. The voltage difference between the Q13 emitter and +15 VF1 is set at 2 V when Q6 is off and 4 V when Q6 is on. The voltage difference is held across a switchable resistance between the Q13 emitter and +15 VF1. FET switches Q7, Q8, and Q9 connect resistors in parallel with R14 to change the current supplied by the current source. When Q7, Q8, and Q9 are off, R14 sets the Q13 collector current. In certain sweep times, Q9 is turned on by U2C. (Refer to the table on the schematic, Note 6.) This places R11 In parallel with R14, increasing the current by a factor of 5. Similarly, R12 or R13 may be switched in to increase current by factors of 10 and 50 respectively. Q7, Q8, and Q9 are controlled by open-collector drivers U2B, U2A, and U2C. The FET switches are on when the FET gate voltage is high (+15 V) and off when the FET gate voltage is low (approximately +0.2 V). U3B decodes the sweep rate control lines from U6 and controls U2A, U2B, and U2C.

Fast Sweep Generator (C)

To produce the fast sweep ramp for sweep times $\leq$ 100 μsec, current from Q13 charges timing capacitor C4. For sweep times of 200 μsec to 10 msec, Q11 is turned on, placing timing capacitor C5 in parallel with C4, increasing the sweep time by a factor of 100. C4 and C5 (if it is in the circuit) are discharged by Q10 and Q12 at the end of the sweep.

Discharge Switch. When no sweep is in progress, the output of open-collector inverter U7D is high (+5V), and current through R30 and R31 flow into Q10 and through CR6 into Q12. In addition, current flows from Q13 into Q12. At the start of a fast sweep ramp, U7D pin 8 goes low, and the voltage at the anode of CR6 and the emitter of Q10 is pulled slightly negative by R32. CR6 becomes reverse biased, and Q10 turns off, turning Q12 off. Current from the collector of Q13 now flows into timing capacitors C4 and C5, and the sweep ramp begins. When the end of the sweep ramp (+2.2V) is detected by the Fast Sweep Control circuit, U7D pin 8 goes high (about +5V), turning Q10 On. This turns Q12 on, and it begins to discharge C4 and C5. Q12 continues to discharge the timing capacitors until CR6 becomes forward biased. At that time, the circuit reaches equilibrium, holding the sweep ramp at near 0 V, with the offset adjusted by R34.

Fast Sweep Buffer Amplifier. Op amp U14 is connected as a unity gain buffer amplifier, which provides the low impedance fast sweep ramp output (FS OUT). FS OUT is applied to the X-axis scan multiplexer in A3A2 Intensity Control.

Fast Sweep Control (D)

The Fast Sweep Control contains circuitry for end of sweep detection and controls fast sweep dead time, fast sweep triggering.

End of Sweep Detection. When the sweep ramp reaches about +2.2 V, Q5 conducts and turns Q4 on. When the collector of Q4 goes low, U1B pin 5 produces a pulse whose length is the dead time. U10A and U10B are cleared when U10B pin 5 goes low, and timing capacitors C4 and C5 are discharged by the Discharge Switch in the Fast Sweep Generator. Voltage divider R19 and R20 set the level at which Q5 senses the end of the sweep ramp.(Note that the fast sweep ramp ends beyond the right-hand edge of the CRT.) The LRTRC line from U10B pin 5, which is high during the sweep, supplies the retrace blanking signal to A3A2 Intensity Control.

Fast Sweep Dead Time. Multivibrator U1B controls the sweep dead time. U1B is triggered at the end of the fast sweep ramp and holds U10A and U10B cleared for a time that is determined by C7, R24, and R25. This prevents the triggering of further ramps for the length of the pulse from U1B pin 5. The length of the dead time is about 15 μsec for sweep times from 1 μsec through 100 msec and about 120 μsec for sweep times from 200 μsec through 10 msec. The ST 100 line (from U6 pin 12 in the Fast Sweep Time Control circuit) controls the length of the sweep dead time by switching the U1B timing resistors with transistor switch Q3. In sweep times of 10 msec through 200 μsec, Q3 is off and the dead time, set by C7 and R24, is 120 μsec. In sweep times of 100 μsec through 1 μsec, Q3 is on, placing R25 in parallel with R24 to decrease the dead time to 15 μsec. C6 and R23 supply additional base drive to Q4 at the end of the sweep to insure triggering of U1B.

Fast Sweep Triggering. Flip-flops U10A and U10B control the state of the fast sweep generator. U10A controls the Discharge Switch through inverter/buffer U7D. At the end of a fast sweep. both U10A and U10B are held cleared by the dead time circuit (U1B and U7F). Following the dead time, a trigger from U16 pin 5 causes U10B pin 7 to go low. This causes U10A pin 5 to go high, which turns off the Discharge Switch and starts a sweep ramp. This can occur only if FS EN is high. If FS EN is low, the J and K inputs of U10B are held low and a trigger will not set U10B.

Fast Sweep Multiplexing. In Fast Sweep mode, the X ouput of A3A3 Line Generator and the fast sweep ramp must be multiplexed to A1A4 X Deflection Amplifier to produce a display consisting of the graticule and characters with the fast sweep ramp and the analog video signal. The video signal from A4A1 Video Processor is multiplexed to A1A5 Y Deflection Amplifier when the fast sweep ramp is multiplexed to A1A4. The X and Y multiplexers are located in A3A2 Intensity Control.

In Fast Sweep mode, the output from A3A3 is applied to the CRT deflection amplifiers following the completion of at least one fast sweep ramp.

Fast Sweep Intensity Control (E)

To provide uniform intensity between the fast sweep trace and the other information displayed on the CRT, the Fast Sweep Intensity Control circuit generates a voltage to control the CRT beam intensity (Z-axis) when the fast sweep ramp is multiplexed in.

The FSZ voltage is dependent on the duty cycle of the fast sweep ramp; that is, the ratio of time during which the ramp is in progress to the sum of dead time and sweep time. FSZ varies from about 150 mV (low beam intensity) for high duty cycle operation to about 2V (high beam intensity) for very low duty cycle operation.

The LRTRC line, high during the fast sweep ramp, provides a digital waveform which is averaged and inverted by Q2, C15, and associated circuity, providing an output voltage to Q1 that is dependent on the average value of the LRTRC signal. Q1 is an emitter follower which provides drive when the FSZ signal is above ≈ 150 mV for low duty cycle sweep operation (less than about 20 percent). When the voltage at the collector of Q2 is below $+0.7$ V (high duty cycle operation), the base-emitter junction of Q1 is off, and the FSZ voltage is held at about 150 mV by voltage divider R71 and R72.

Table 9-19. A3A1 Trigger, Replaceable Parts (1 of 3)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A1	85662-60014	1	BOARD ASSEMBLY, TRIGGER	28480	85662-60014
A3A1C1	0160-0174	3	CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A3A1C2	0160-0174		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A3A1C3	0160-2252	1	CAPACITOR-FXD 6.2PF +-.25PF 500VDC	28480	0160-2252
A3A1C4	0140-0233	1	CAPACITOR-FXD 480PF +-1% 300VDC MICA 0+70	72136	DM15F481F0300WV1C
A3A1C5	0160-4314	1	CAPACITOR-FXD .05UF +-1% 200VDC	28480	0160-4314
A3A1C6	0160-2307	1	CAPACITOR-FXD 47PF +-5% 300VDC	28480	0160-2307
A3A1C7	0160-0155	1	CAPACITOR-FXD 3300PF +-10% 200VDC POLYE	0420J	292P33292
A3A1C8	0160-4084	2	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A1C9	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A3A1C10			NOT ASSIGNED		
A3A1C11	0160-3456	1	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A3A1C12	0180-0197	7	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A3A1C13			NOT ASSIGNED		
A3A1C14	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A3A1C15	0180-0374	1	CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A3A1C16	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A3A1C17	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A3A1C18	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A3A1C19	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A3A1C20	0160-0174		CAPACITOR-FXD .47UF +80-20% 25VDC CER	28480	0160-0174
A3A1C21			NOT ASSIGNED		
A3A1C22			NOT ASSIGNED		
A3A1C23	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A3A1C24			NOT ASSIGNED		
A3A1C25			NOT ASSIGNED		
A3A1C26			NOT ASSIGNED		
A3A1C27	0160-2055	3	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C28	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1C29	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A3A1CR1	1901-0535	4	DIODE-SCHOTTKY	28480	1901-0535
A3A1CR2	1901-0535		DIODE-SCHOTTKY	28480	1901-0535
A3A1CR3	1901-0535		DIODE-SCHOTTKY	28480	1901-0535
A3A1CR4	1901-0535		DIODE-SCHOTTKY	28480	1901-0535
A3A1CR5	1901-0040	1	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A3A1CR6	1901-0179	1	DIODE-SWITCHING 15V 50MA 750PS DO-7	28480	1901-0179
A3A1L1	9140-0114	3	COIL-MLD 10UH 10% Q=65 .155DX.375LG	02178	15.444J-2K
A3A1L2	9140-0114		COIL-MLD 10UH 10% Q=65 .155DX.375LG	02178	15.444J-2K
A3A1L3	9140-0114		COIL-MLD 10UH 10% Q=55 .155DX.375LG	02178	15.444J-2K
A3A1Q1	1854-0404	6	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A1Q2	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A1Q3	1853-0281	2	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02030	2N2907A
A3A1Q4	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A1Q5	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02030	2N2907A
A3A1Q6	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A1Q7	1855-0020	3	TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A3A1Q8	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A3A1Q9	1855-0020		TRANSISTOR J-FET N-CHAN D-MODE TO-18 SI	28480	1855-0020
A3A1Q10	1853-0034	1	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0034
A3A1Q11	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A1Q12	1854-0546	1	TRANSISTOR NPN SI TO-72 PD=200MW	28480	1854-0546
A3A1Q13	1853-0050	1	TRANSISTOR PNP SI TO-18 PD=360MW	28480	1853-0050
A3A1Q14	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A3A1Q15	1854-0039	1	TRANSISTOR NPN 2N3053 SI TO-39 PD=1W	02030	2N3053
A3A1R1	0698-6863	1	RESISTOR 1.537K .25% .125W F TC=0+-50	[illegible]	0698-6863
A3A1R2	0698-6867	1	RESISTOR 7.35K .25% .125W F TC=0+-50	[illegible]	0698-6867
A3A1R3	0698-7794	1	RESISTOR 10K .25% .125W F TC=0+-100	0299E	MFRC1/8-T0-1002-C
A3A1R4	0757-0279	10	RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A3A1R5	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A3A1R6	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A3A1R7	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A3A1R8	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A3A1R9	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A3A1R10	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A3A1R11	0698-5573	1	RESISTOR 50K .5% .125W F TC=0+-100	03298	C4-1/8-T0-5003-D
A3A1R12	0698-8014	1	RESISTOR 22.3K .5% .125W F TC=0+-50	0299E	MFRC1/8-T2-2232-D
A3A1R13	0698-6840	1	RESISTOR 4.07K .5% .125W F TC=0+-50	03298	NC4-1/8-T2-4071-D
A3A1R14	0698-6217	1	RESISTOR 200K .5% .125W F TC=0+-100	03298	C4
A3A1R15	0757-0416	4	RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511[illegible]-F
A3A1R16	0757-0280	11	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A1R17	0698-0083	2	RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A3A1R18	0698-3440	2	RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196[illegible]-F
A3A1R19	0757-0443	1	RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1101-F
A3A1R20	0757-1094	2	RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F

Table 9-19. A3A1 Trigger, Replaceable Parts (2 of 3)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A1R21	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A1R22	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A1R23	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A1R24	0757-0465	1	RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A3A1R25	0757-0444	1	RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A3A1R26	0698-3156	4	RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A3A1R27	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A3A1R28	0698-0083		RESISTOR 1.96K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1961-F
A3A1R29	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A1R30	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A1R31	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A3A1R32	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A3A1R33	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A3A1R34	2100-1972	1	RESISTOR-TRMR 20K 10% WW SIDE-ADJ 20-TRN	03740	3005P-1-203
A3A1R35	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A3A1R36	0698-3441	1	RESISTOR 215 1% .125W F TC=0+-100	03298	C4-1/8-T0-215R-F
A3A1R37	0698-3445	1	RESISTOR 348 1% .125W F TC=0+-100	03298	C4-1/8-T0-348R-F
A3A1R38			NOT ASSIGNED		
A3A1R39			NOT ASSIGNED		
A3A1R40	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A3A1R41	0698-3156		RESISTOR 14.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1472-F
A3A1R42	0757-0438	1	RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A3A1R43	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A3A1R44			NOT ASSIGNED		
A3A1R45	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A1R46	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A3A1R47	0757-0416		RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A3A1R48	0757-0442	3	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A1R49	0757-0289	1	RESISTOR 13.3K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-1332-F
A3A1R50	0683-1555	1	RESISTOR 1.5M 5% .25W FC TC=-900/+1100	[illegible]	0683-1555
A3A1R51	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A1R52	0698-3260	1	RESISTOR 464K 1% .125W F TC=0+-100	01606	CC
A3A1R53	0757-0279		RESISTOR 3.16K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3161-F
A3A1R54	0757-0346	3	RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A3A1R55	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A3A1R56	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A3A1R57			NOT ASSIGNED		
A3A1R58	0698-3450	2	RESISTOR 42.2K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4222-F
A3A1R59	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A1R60	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A1R61	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A1R62	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A3A1R63			NOT ASSIGNED		
A3A1R64			NOT ASSIGNED		
A3A1R65	0698-0085	1	RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A3A1R66	0698-3154	1	RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A3A1R67	0757-0290	1	RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A3A1R68	0698-3160		RESISTOR 31.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3162-F
A3A1R69	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A3A1R70			NOT ASSIGNED		
A3A1R71	0698-3447	1	RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A3A1R77	0698-3450		1	03298	C4-1/8-T0-4222-F
A3A1TP1	1251-0600	5	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A3A1TP2	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A3A1TP3	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A3A1TP4	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A3A1TP5	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A3A1U1	1820-1423	2	IC MV TTL LS MONOSTBL RETRIG DUAL	0169H	SN74LS123N
A3A1U2	1820-1417	1	IC GATE TTL LS NAND QUAD 2-INP	0169H	SN74LS26N
A3A1U3	1820-1261	1	IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	0379D	AM74LS139
A3A1U4	1820-1112	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG	0169H	SN74LS74N
A3A1U5	1820-1196	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS174N
A3A1U6	1820-1196		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	0379D	AM74LS174N
A3A1U7	1820-0471	1	IC INV TTL HEX 1-INP	02233	7406PC
A3A1U8	1826-0319	2	IC OP AMP	0340F	LF356H
A3A1U9	1820-1423		IC MV TTL LS MONOSTBL RETRIG DUAL	0169H	SN74LS123N
A3A1U10	1820-1212	1	IC FF TTL LS J-K NEG-EDGE-TRIG	0169H	SN74LS112N
A3A1U11	1820-1201	1	IC GATE TTL LS AND QUAD 2-INP	0169H	SN74LS08N
A3A1U12	1820-1112		IC FF TTL LS D-TYPE POS-EDGE-TRIG	0169H	SN74LS74N
A3A1U13	1820-0475	1	IC COMPARATOR	0340F	LM306H
A3A1U14	1826-0319		IC OP AMP	0340F	LF356H
A3A1U15	1820-1425	1	IC SCHMITT-TRIG TTL LS NAND QUAD 2-INP	0169H	SN74LS132N
A3A1U16	1820-1298	1	IC MUXR/DATA-SEL TTL LS 8-TO-1-LINE	0169H	SN74LS251N
A3A1U17	1820-1197	1	IC GATE TTL LS NAND QUAD 2-INP	0169H	SN74LS00N
A3A1U18	1820-1216	1	IC DCDR TTL LS 3-TO-8-LINE 3-INP	0379D	SN74LS138N

Table 9-19. A3A1 Trigger, Replaceable Parts (3 of 3)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A1VR1	1902-3224	2	DIODE-ZNR 17.8V 5% DO-7 PD=.4W TC=+.067%	02223G	FZ7284
A3A1VR2	1902-3224		DIODE-ZNR 17.8V 5% DO-7 PD=.4W TC=+.067%	02223G	FZ7284
A3A1VR3	1902-3182	1	DIODE-ZNR 12.1V 5% DO-7 PD=.4W TC=+.064%	02223G	FZ7268
A3A1VR4	1902-0041	2	DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	02203G	BZ 10939-98
A3A1VR5	1902-0041		DIODE-ZNR 5.11V 5% DO-7 PD=.4W TC=-.009%	02203G	BZ 10939-98
			A3A1 MISCELLANEOUS PARTS		
	1480-0073	1	PINDRIVE 0.250" LG		
	1902-3182		EXTRACTOR, PC BOARD		

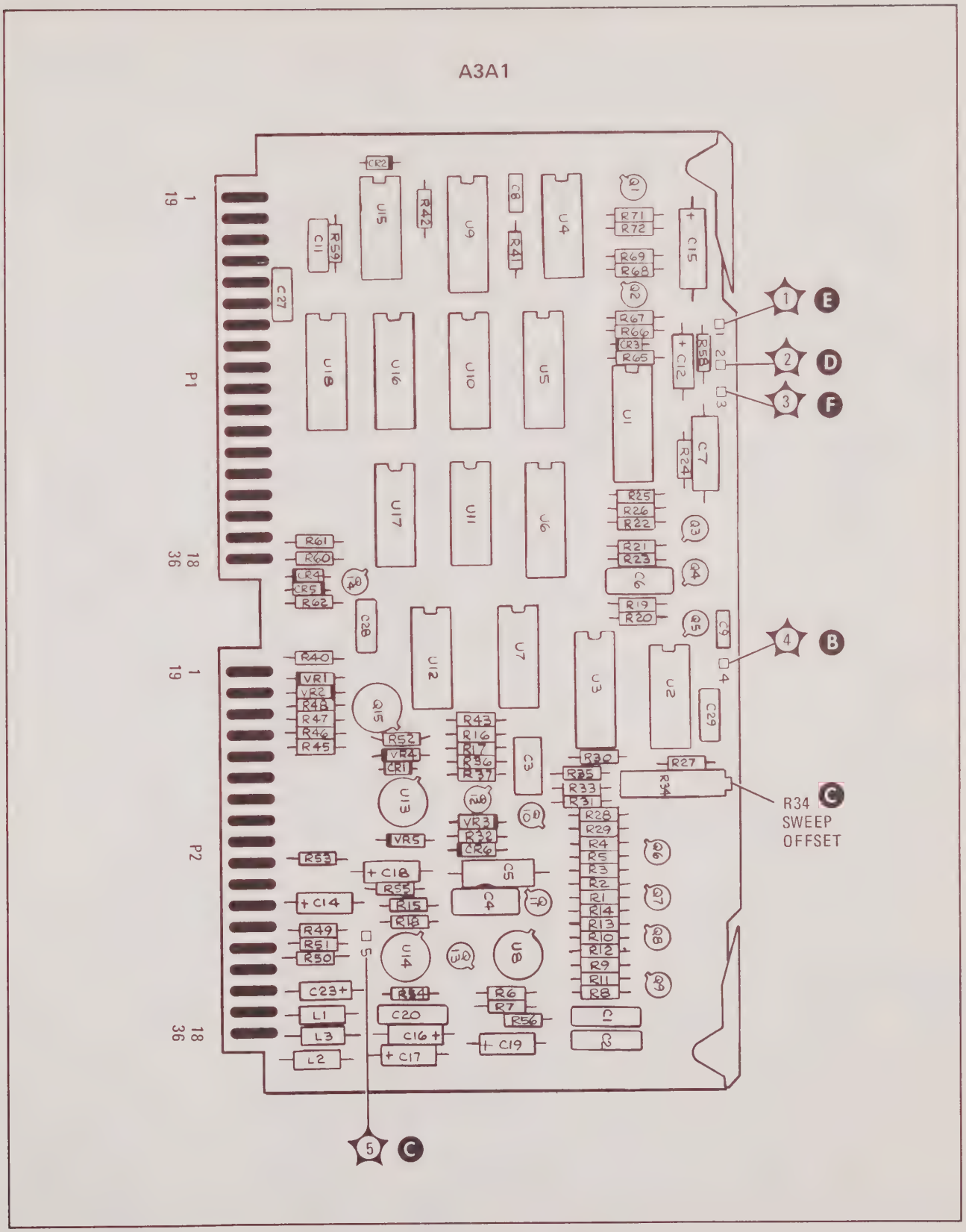


Figure 9-104. A3A1 Trigger, Component Locations

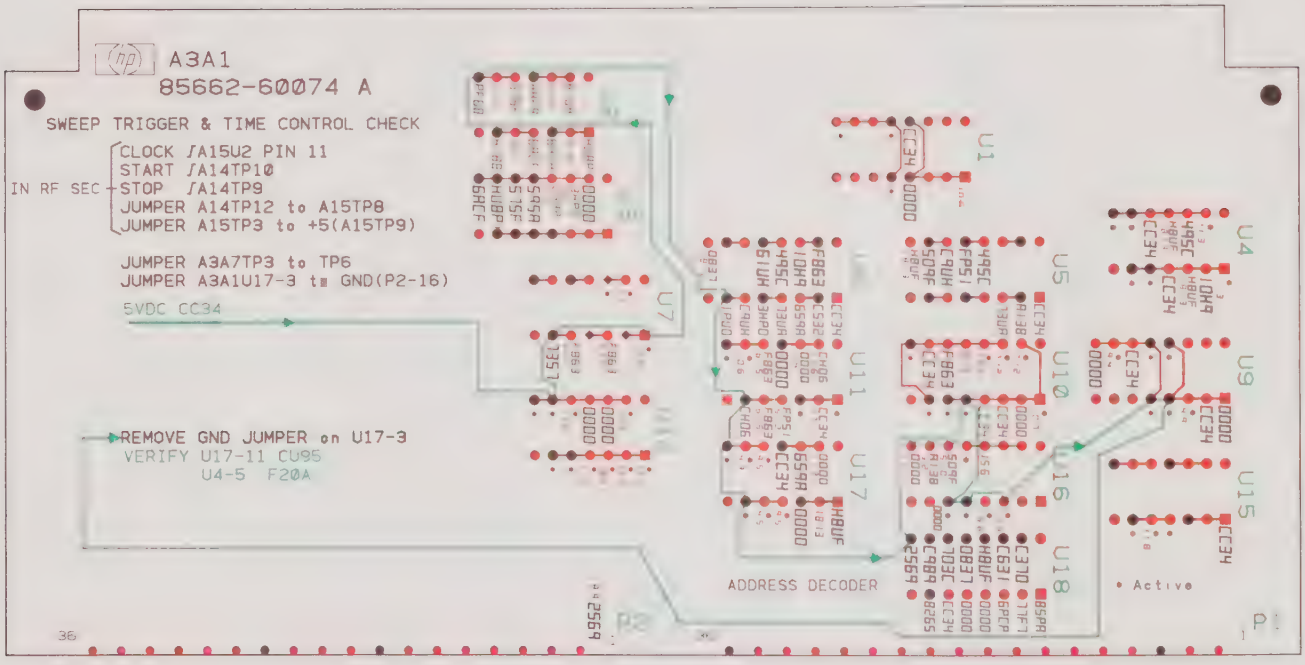


Figure 9-105. A3A1 Trigger, Signature Analysis Troubleshooting Diagram

Table 9-20. A3A10 Digital Storage Motherboard, Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A3A10	85662-60015	1	BOARD ASSEMBLY,DIGITAL STORAGE MOTHER BD (INCLUDES W2 AND W3)	28480	85662-60015
A3A10J1	1200-0508	1	SOCKET-IC 14-CONT DIP-SLDR	06776	0002812
A3A10J2	1251-4827	1	CONNECTOR 50-PIN M POST TYPE	0138J	2-87227-5
A3A10J3	1251-4804	1	CONNECTOR 4-PIN M POST TYPE	22526	65595-104
A3XA1P1	1251-2026	14	CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A3XA1P2	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A3XA2P1	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A3XA2P2	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A3XA3P1	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A3XA3P2	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A3XA4P1	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A3XA5P1	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A3XA6P1	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A3XA6P2	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A3XA7P1	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A3XA7P2	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A3XA8P1	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A3XA9P1	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300

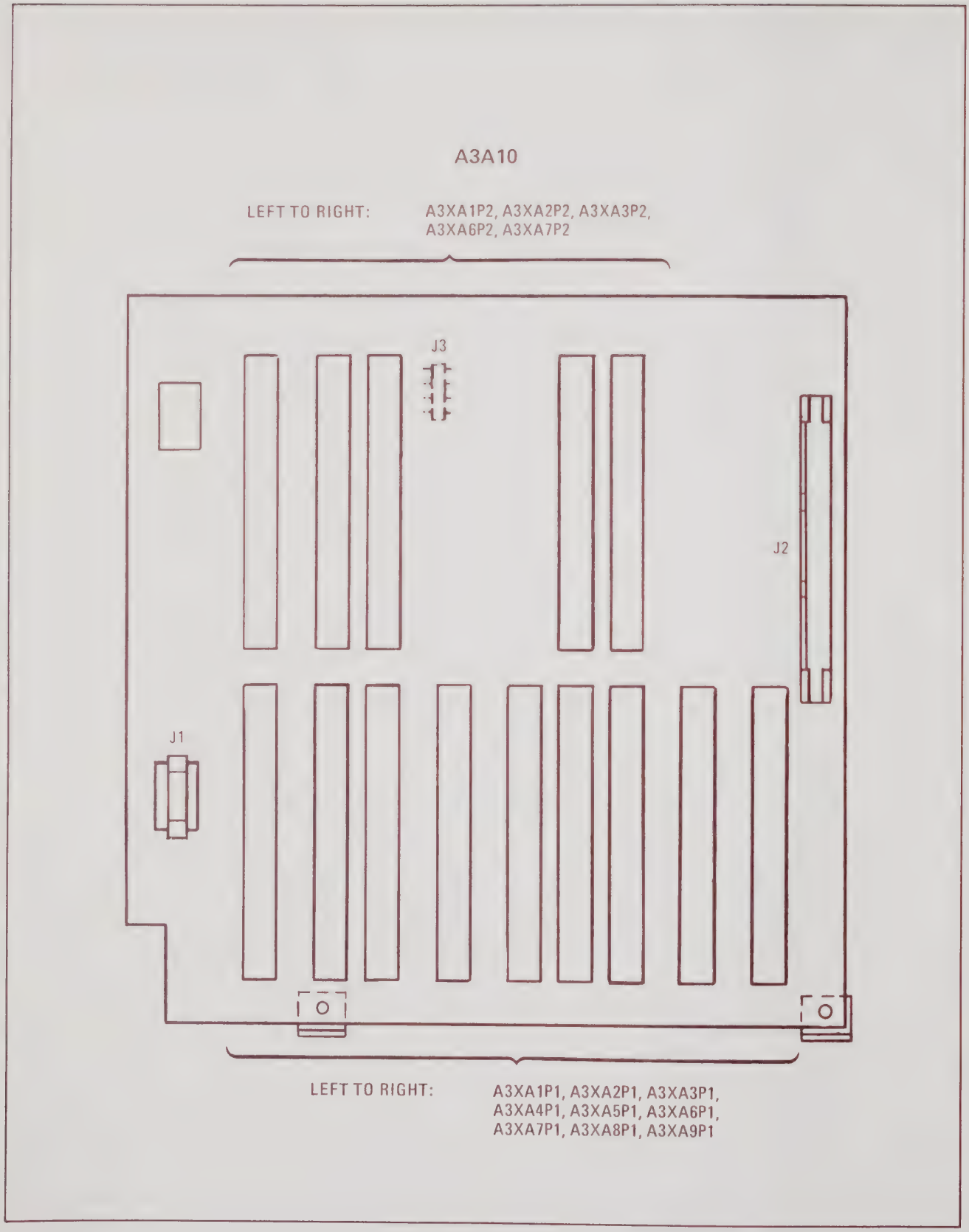


Figure 9-108. A3A10 Digital Storage Motherboard, Component Locations

A1A4 A1A5 X AND Y DEFLECTION AMPLIFIERS, CIRCUIT DESCRIPTION (Service Sheet 24)

A1A4 X Deflection Amplifier and A1A5 Y Deflection Amplifier each consists of a differential input state (Q10, Q15) with current source Q11, two current gain stages (Q9, Q14 and Q8, Q13), and two output differential current-to-voltage amplifiers. A display output amplifier provides rear-panel X and Y DISPLAY OUTPUTS.

Current Amplifier (B)

The Current Amplifier transforms an input voltage change to a differential current change at the collectors of Q10 and Q15. This change is amplified in the following current gain stages Q9 and Q14. POSN adjust R7 sets the CRT trace position, and GAIN adjust R27 sets the CRT trace deflection limits.

The collectors of Q8 and Q13 are at virtual-ground, current-summing junctions of the output amplifiers. When a signal is applied so as to increase the current in Q8 (decrease in Q13) Q5 conducts more, turning off Q2 and causing the output (collector of Q2) to rise. Current feedback through R29 supplies the increase in current required by Q8. The analogous operation, with inverted polarity, occurs in the other output amplifier.

Current to Voltage Amplifiers (C) (D)

Emitter followers Q7 and Q12 are feedforward amplifiers, coupling the drive signal directly to the bases of Q1 and Q4, thus improving the frequency response. Trimmer capacitors C10 and C11, along with HF GAIN potentiometer R28, adjust the amplifier frequency response for minimum overshoot and equal risetimes (≈70 nsec).

An input signal of 0 to 2V peak will cause a beam deflection equal to the length of the graticule lines.

Display Output (A)

Display output amplifier U1 provides a 1-volt maximum rear-panel signal to the X and Y DISPLAY OUTPTS.

Table 9-21. A1A4 X Deflection Amplifier, Replaceable Parts (1 of 2)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A4	85662-60057	1	BOARD ASSEMBLY, X-DEFLECTION AMPLIFIER	28480	85662-60057
A1A4C1	0180-0374	2	CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A1A4C2	0180-0374		CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A1A4C3	0160-4084	6	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A4C4	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A4C5	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A4C6	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A4C7	0160-3670	3	CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A4C8	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A4C9	0160-3533	1	CAPACITOR-FXD 470PF +-5% 300VDC MICA 0+70	28480	0160-3533
A1A4C10	0121-0474	2	CAPACITOR-V TRMR-PSTN .3-1.5PF 600V	28480	0121-0474
A1A4C11	0121-0474		CAPACITOR-V TRMR-PSTN .3-1.5PF 600V	28480	0121-0474
A1A4C12	0160-2055	4	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A1A4C13	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A1A4C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A1A4C15	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A1A4C16	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A4C17	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A4C18	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A4CR1	1901-0040	2	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1A4CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1A4E1	1251-0600	2	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A4E2	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A4L1	9140-0210	3	COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1313-12J
A1A4L2	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1313-12J
A1A4L3	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1313-12J
A1A4Q1	1853-0232	2	TRANSISTOR PNP SI TO-39 PD=1W FT=200MHZ	28480	1853-0232
A1A4Q2	1854-0523	2	TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A1A4Q3	1854-0523		TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A1A4Q4	1853-0232		TRANSISTOR PNP SI TO-39 PD=1W FT=200MHZ	28480	1853-0232
A1A4Q5	1853-0007	7	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02033	2N3251
A1A4Q6	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02033	2N3251
A1A4Q7	1854-0404	4	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A4Q8	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A4Q9	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02033	2N3251
A1A4Q10	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02033	2N3251
A1A4Q11	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02033	2N3251
A1A4Q12	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A4Q13	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A4Q14	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02033	2N3251
A1A4Q15	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02033	2N3251
A1A4R1	0757-0438	3	RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A1A4R2	0757-0394	3	RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A1A4R3	0698-3150	2	RESISTOR 2.37K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2371-F
A1A4R4	0698-3150		RESISTOR 2.37K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2371-F
A1A4R5	0698-3155	2	RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A1A4R6	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A1A4R7	2100-3353	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	03740	3386X-Y46-203
A1A4R8	0757-0401	4	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A1A4R9	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A1A4R10	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A1A4R11	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A1A4R12	0757-0428	2	RESISTOR 1.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A1A4R13	0757-0428		RESISTOR 1.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A1A4R14	0757-0440	1	RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A1A4R15	0757-0444	1	RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A1A4R16	0698-0084	4	RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A1A4R17	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A1A4R18	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A1A4R19	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A1A4R20	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A1A4R21	0757-1094	1	RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A1A4R22	0757-0460	2	RESISTOR 61.9K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6192-F
A1A4R23	0757-0460		RESISTOR 61.9K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6192-F
A1A4R24	0698-3153	3	RESISTOR 3.83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A1A4R25	0698-3153		RESISTOR 3.83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A1A4R26	0757-0421	1	RESISTOR 825 1% .125W F TC=0+-100	03298	C4-1/8-T0-825R-F
A1A4R27	2100-3273	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	73138	72-144-0
A1A4R28	2100-3352	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	73138	72-143-0
A1A4R29	0698-3415	2	RESISTOR 19.6K 1% .5W F TC=0+-100	0552C	CMF-65-2
A1A4R30	0698-3415		RESISTOR 19.6K 1% .5W F TC=0+-100	0552D	CMF-65-2

Table 9-21. A1A4 X Deflection Amplifier, Replaceable Parts (2 of 2)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A4R31	0757-0439	2	RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A1A4R32	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A1A4R33	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A1A4R34	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A1A4R35	0757-0851	2	RESISTOR 43.2K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-4322-F
A1A4R36	0757-0851		RESISTOR 43.2K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-4322-F
A1A4R37	0757-0346	4	RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A1A4R38	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A1A4R39	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A1A4R40	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A1A4R41	0757-0873	2	RESISTOR 1.62K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-1624-F
A1A4R42	0757-0873		RESISTOR 1.62K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-1624-F
A1A4R43	0698-3153		RESISTOR 3.83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A1A4R44	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A1A4TP1	0360-0535	3	TERMINAL, TEST POINT	28480	0360-0535
A1A4TP2	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A1A4TP3	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A1A4U1	1826-0021	1	IC OP AMP	0340F	LM310H
			A1A4 MISCELLANEOUS PARTS		
	5000-9043	1	PIN:P.C. BOARD EXTRACTOR	28480	5000-9043
	5040-6843	1	EXTRACTOR, P.C. BOARD	28480	5040-6843

Table 9-22. A1A5 Y Deflection Amplifier, Replaceable Parts (1 of 2)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A5	85662-60057	1	BOARD ASSEMBLY, Y-DEFLECTION AMPLIFIER	28480	85662-60057
A1A5C1	0180-0374	2	CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A1A5C2	0180-0374		CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A1A5C3	0160-4084	6	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A5C4	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A5C5	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A5C6	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A5C7	0160-3670	3	CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A5C8	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A5C9	0160-3533	1	CAPACITOR-FXD 470PF +-5% 300VDC MICA 0+70	28480	0160-3533
A1A5C10	0121-0474	2	CAPACITOR-V TRMR-PSTN .3-1.5PF 600V	28480	0121-0474
A1A5C11	0121-0474		CAPACITOR-V TRMR-PSTN .3-1.5PF 600V	28480	0121-0474
A1A5C12	0160-2055	4	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A1A5C13	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A1A5C14	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A1A5C15	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A1A5C16	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A5C17	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A5C18	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A5CR1	1901-0040	2	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1A5CR2	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1A5E1	1251-0600	2	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A5E2	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A5L1	9140-0210	3	COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A1A5L2	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A1A5L3	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A1A5Q1	1853-0232	2	TRANSISTOR PNP SI TO-39 PD=1W FT=200MHZ	28480	1853-0232
A1A5Q2	1854-0523	2	TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A1A5Q3	1854-0523		TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A1A5Q4	1853-0232		TRANSISTOR PNP SI TO-39 PD=1W FT=200MHZ	28480	1853-0232
A1A5Q5	1853-0007	7	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02036	2N3251
A1A5Q6	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02036	2N3251
A1A5Q7	1854-0404	4	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A5Q8	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A5Q9	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02036	2N3251
A1A5Q10	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02036	2N3251
A1A5Q11	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02036	2N3251
A1A5Q12	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A5Q13	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A5Q14	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02036	2N3251
A1A5Q15	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02036	2N3251
A1A5R1	0757-0438	3	RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A1A5R2	0757-0394	3	RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A1A5R3	0698-3150	2	RESISTOR 2.37K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2371-F
A1A5R4	0698-3150		RESISTOR 2.37K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2371-F
A1A5R5	0698-3155	2	RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A1A5R6	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A1A5R7	2100-3353	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	03740	3386X-Y46-203
A1A5R8	0757-0401	4	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A1A5R9	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A1A5R10	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A1A5R11	0757-0401		RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A1A5R12	0757-0428	2	RESISTOR 1.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A1A5R13	0757-0428		RESISTOR 1.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A1A5R14	0757-0440	1	RESISTOR 7.5K 1% .125W F TC=0+-100	03298	C4-1/8-T0-7501-F
A1A5R15	0757-0444	1	RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A1A5R16	0698-0084	4	RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A1A5R17	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A1A5R18	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A1A5R19	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A1A5R20	0698-3155		RESISTOR 4.64K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4641-F
A1A5R21	0757-1094	1	RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A1A5R22	0757-0460	2	RESISTOR 61.9K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6192-F
A1A5R23	0757-0460		RESISTOR 61.9K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6192-F
A1A5R24	0698-3153	3	RESISTOR 3.83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A1A5R25	0698-3153		RESISTOR 3.83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A1A5R26	0757-0421	1	RESISTOR 825 1% .125W F TC=0+-100	03298	C4-1/8-T0-825R-F
A1A5R27	2100-3273	1	RESISTOR-TRMR 2K 10% C SIDE-ADJ 1-TRN	73138	72-144-0
A1A5R28	2100-3352	1	RESISTOR-TRMR 1K 10% C SIDE-ADJ 1-TRN	73138	72-143-0
A1A5R29	0698-3415	2	RESISTOR 19.6K 1% .5W F TC=0+-100	0552D	CMF-65-2
A1A5R30	0698-3415		RESISTOR 19.6K 1% .5W F TC=0+-100	0552D	CMF-65-2

Table 9-22. A1A5 Y Deflection Amplifier, Replaceable Parts (2 of 2)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A5R31	0757-0439	2	RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A1A5R32	0757-0439		RESISTOR 6.81K 1% .125W F TC=0+-100	03298	C4-1/8-T0-6811-F
A1A5R33	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A1A5R34	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A1A5R35	0757-0851	2	RESISTOR 43.2K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-4322-F
A1A5R36	0757-0851		RESISTOR 43.2K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-4322-F
A1A5R37	0757-0346	4	RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A1A5R38	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A1A5R39	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A1A5R40	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A1A5R41	0757-0873	2	RESISTOR 1.62K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-1624-F
A1A5R42	0757-0873		RESISTOR 1.62K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-1624-F
A1A5R43	0698-3153		RESISTOR 3.83K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3831-F
A1A5R44	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A1A5TP1	0360-0535	3	TERMINAL, TEST POINT	[illegible]	0360-0535
A1A5TP2	0360-0535		TERMINAL, TEST POINT	[illegible]	0360-0535
A1A5TP3	0360-0535		TERMINAL, TEST POINT	[illegible]	0360-0535
A1A5U1	1826-0021	1	IC OP AMP	0340F	LM310H
			A1A5 MISCELLANEOUS PARTS		
	5000-9043	1	PINIP.C. BOARD EXTRACTOR	28480	5000-9043
	5040-6843	1	EXTRACTOR, P.C. BOARD	28480	5040-6843

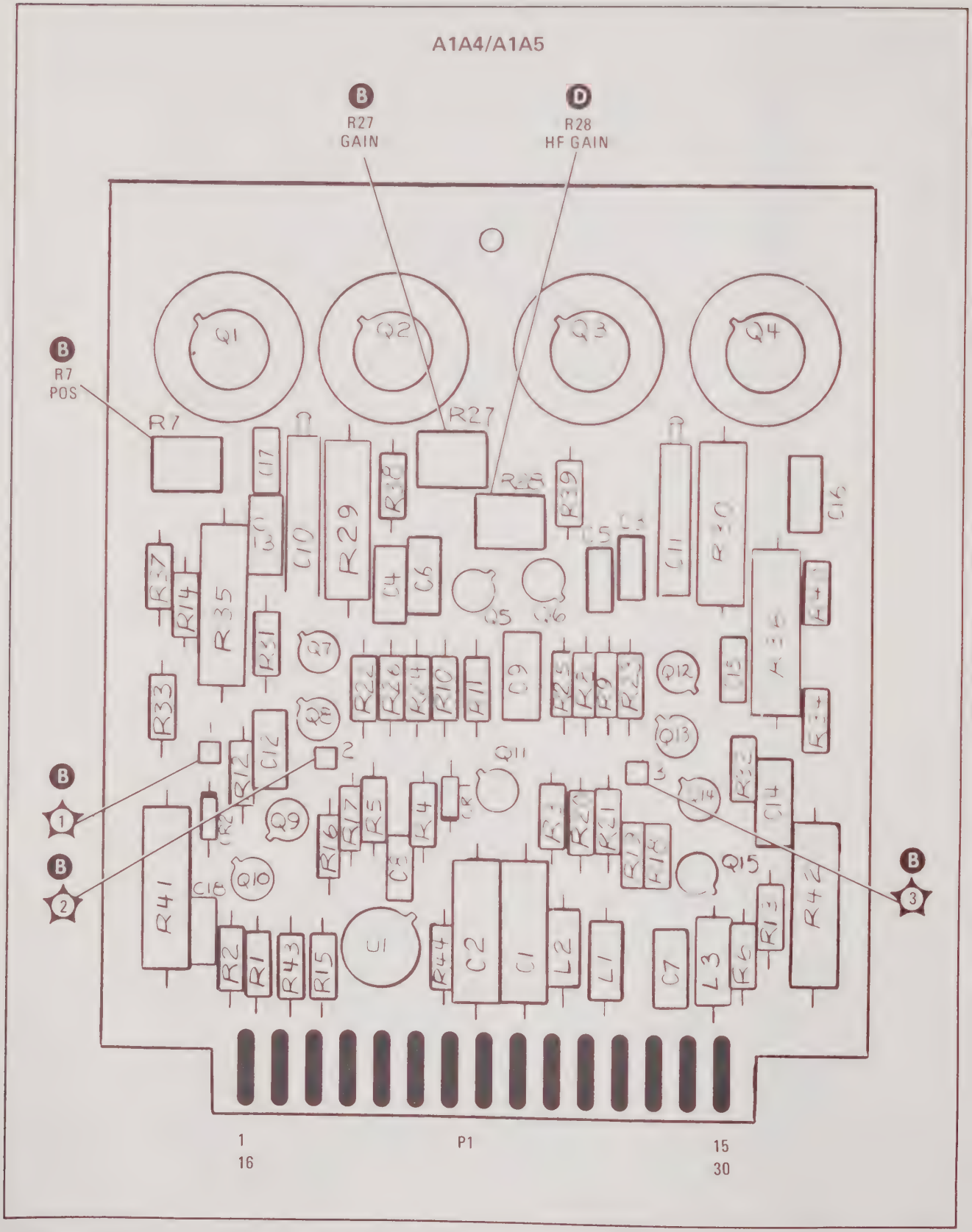


Figure 9-110. A1A4 X Deflection Amplifier and A1A5 Y Deflection Amplifier, Component Locations

A1A1 KEYBOARD, CIRCUIT DESCRIPTION (Service Sheet 25)

A1A1 Keyboard consists of three functional blocks: CRT Controls, Keyboard Switches, and Status Indicators.

CRT Controls (A)

The CRT Controls include the following front-panel potentiometers:

- INTENSITY control R1. Sets the level of the input to A1A2 Z Axis Amplifier.
- ALIGN screwdriver adjustment R8. Sets the CRT trace to horizontal.
- FOCUS screwdriver adjustment R2. Focuses the CRT trace.
- FREQ ZERO screwdriver adjustment R3. For resolution bandwidths of 1 kHz or less, adjusts the frequency of the 18.4 MHz oscillator (A4A5 Step Gain) to precisely align the IF passband to 21.400 MHz.

The front-panel STANDBY indicator, LED DS18, which is driven by the PWR DWN signal from A1A6 ±15V Regulator, is activated when line power is applied while the power supply regulators are off.

Keyboard Switches (B)

The Keyboard Switches are on a matrix of rows and columns connected to the RF Section keyboard by the 50-wire Instrument Bus W8. When a keyboard switch is activated, A15 Processor recognizes the switch and performs the indicated operation.

Status Indicators (C)

The Status Indicators, LEDs DS1 through DS17, show the states of the various keyboard functions. A15 Processor loads the latches U1 and U2 via the Instrument Bus W8 The latch address is decoded in A3A1 Trigger, which generates the ICLK strobe signal.

A1A2 Z AXIS AMPLIFIER, CIRCUIT DESCRIPTION (Service Sheet 25)

A1A2 Z Axis Amplifier receives from A3A2 Intensity Control two signals for control of the CRT: a 0V—2V Z signal proportional to the CRT writing rate, and a blanking signal $\overline{\text{BLANK}}$.

Amplifier (A)

The Z signal, after attenuation by the front-panel INTENSITY potentiometer A1R1, drives the input stage Q9, Q10. This amplifier supplies a differential current output to the Focus Gate Amplifier and, through a Blanking Switch, to the Control Gate Amplifier.

Control Gate Amplifier (C)

The input to the Control Gate Amplifier is a virtual-ground, current-summing junction. Its output voltage is given by:

$$V \cong I_{Q7}\ R25$$

where I_{Q7} is the current in Q7, which is determined by the Z-axis input when $\overline{\text{BLANK}}$ is high. When $\overline{\text{BLANK}}$ is low, Q7 is off, and the output of the Control Gate Amplifier drops to a few volts, blanking the CRT.

Focus Gate Amplifier (D)

The Focus Gate Amplifier supplies a correction voltge to the FOCUS grid of the CRT to compensate for defocusing effects with varying intensity levels. The magnitude of this correction voltage is set by FOCUS GAIN potentiometer R30 and the front-panel FOCUS screwdriver adjustment A1R2. The output stage is identical to that of the Control Gate Amplifier except for the pulse response adjustments (HF GAIN potentiometer R22 and HF TRIM capacitor C10 in the Control Gate Amplifier). These components are fixed in the Focus Gate Amplifier.

CRT Adjustments (E)

The CRT Adjstments set the bias voltages for the various CRT functions. Each adjustment is named on the schematic.

Table 9-23. A1A1 Keyboard, Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A1	85662-60001	1	KEYBOARD ASSEMBLY (INCLUDES W1 & W9)	28480	85662-60001
A1A1C1	0160-4084	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A1DS1	1990-0485	1	LED-VISIBLE LUM-INT=800UCD IF=30MA-MAX	28480	1990-0485
A1A1DS2-A1A1DS18	1990-0487	17	LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0487
A1A1J1	1251-4828	1	CONNECTOR 50-PIN M POST TYPE	0138J	2-87230-5
A1A1Q1	1854-0404	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A1Q2	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A1R1	2100-3587	1	RESISTOR-VAR CONTROL CP 2K 10% 10CW	28480	2100-3587
A1A1R2	2100-2452	3	RESISTOR-TRMR 25K 20% CCP TOP-ADJ 1-TRN	28480	2100-2452
A1A1R3	2100-2452		RESISTOR-TRMR 25K 20% CCP TOP-ADJ 1-TRN	28480	2100-2452
A1A1R4	0757-0458	1	RESISTOR 51.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5112-F
A1A1R5	0757-0420	1	RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A1A1R6	0757-0442	2	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A1R7	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A1R8	2100-2452		RESISTOR-TRMR 25K 20% CCP TOP-ADJ 1-TRN	01600	PR2531U
A1A1R9	0698-3444	3	RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A1A1R10	0698-3161	2	RESISTOR 38.3K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3832-F
A1A1R11	0698-3161		RESISTOR 38.3K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3832-F
A1A1R12	2100-3647	1	RESISTOR-VAR CONTROL CP 5K 10% LIN	28480	2100-3647
A1A1R13	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A1A1R14	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A1A1R15	0757-0401	1	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A1A1S1-A1A1S28	5060-9436	28	SWITCH	28480	5060-9436
A1A1U1	1820-1730	2	IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01697M	SN74LS273
A1A1U2	1820-1730		IC FF TTL LS D-TYPE POS-EDGE-TRIG COM	01697M	SN74LS273
A1A1U3	1810-0203	2	NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	02486C	750-81-R470
A1A1U4	1810-0203		NETWORK-RES 8-PIN-SIP .1-PIN-SPCG	02486C	750-81-R470
A1A1XDS1-A1A1XDS15	1200-0010	16	SOCKET-TUBE 2-CONT	04508	131-52-12-016
A1A1XDS16	1200-0010		SOCKET-TUBE 2-CONT	04508	131-52-12-016

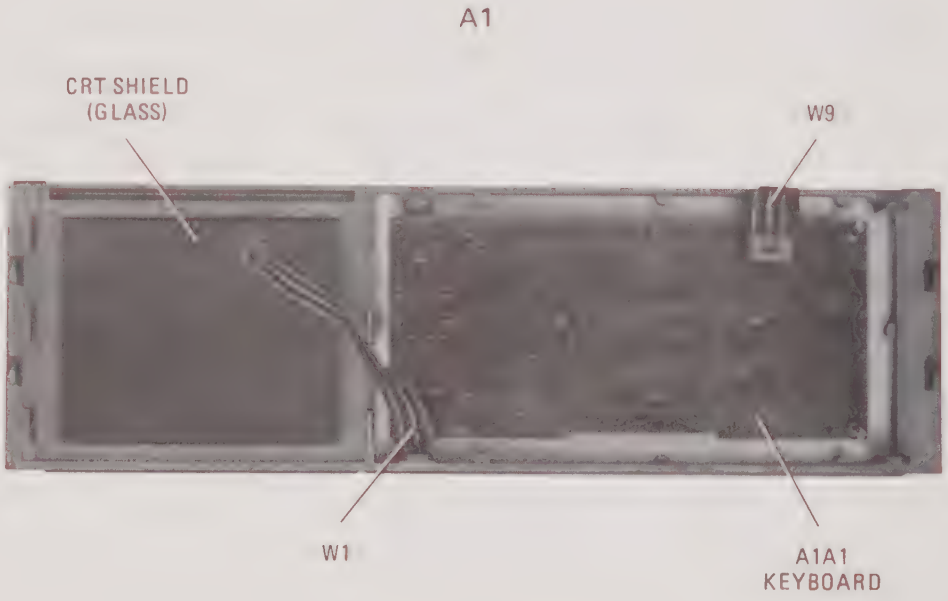


Figure 9-113. A1 Front Panel, Assembly and Component Locations

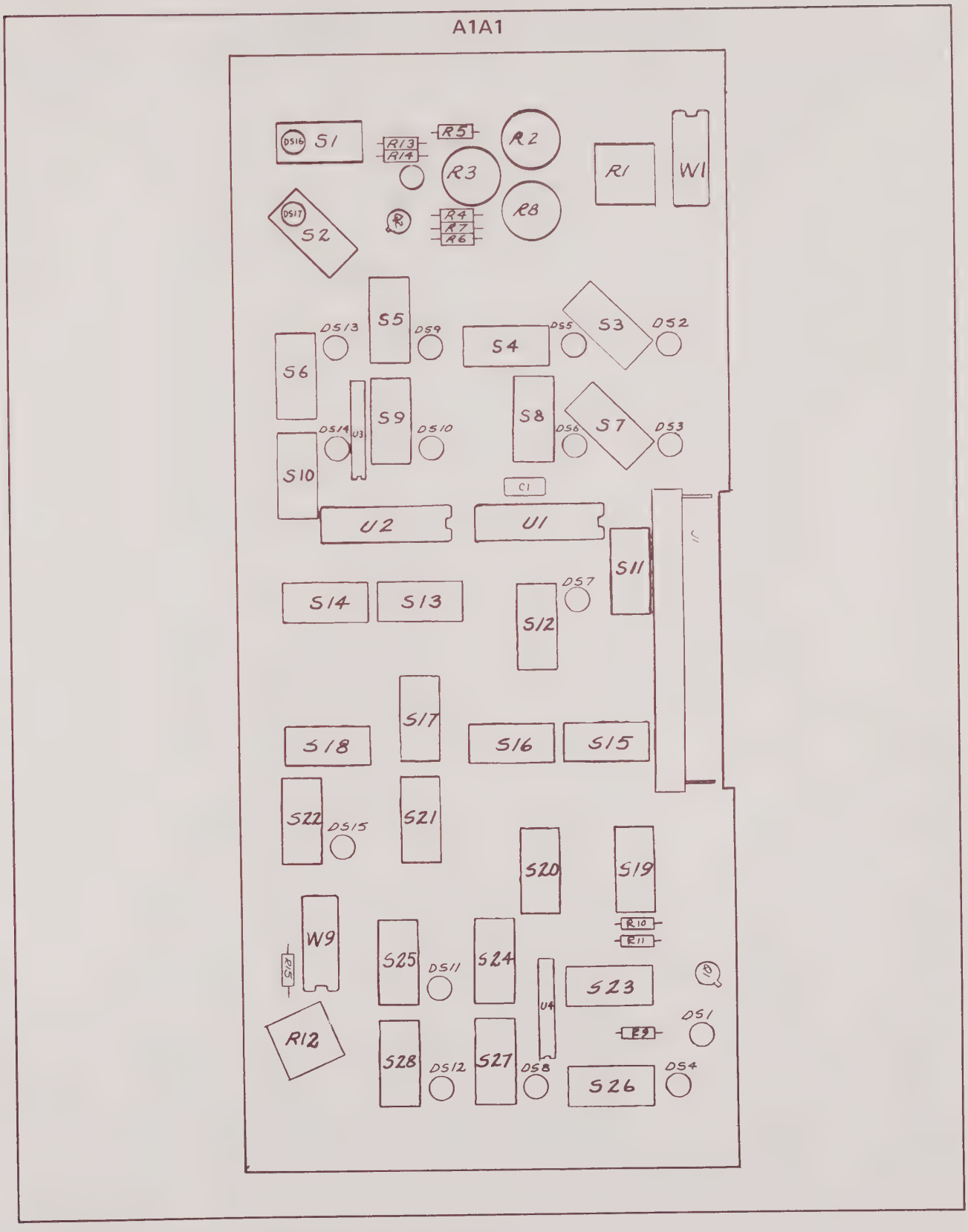


Figure 9-114. A1A1 Keyboard, Component Locations

Table 9-24. A1A2 Z Axis Amplifier, Replaceable Parts (1 of 2)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A2	85662-60054	1	BOARD ASSEMBLY, Z-AXIS AMPLIFIER	28480	85662-60054
A1A2C1	0180-0374	2	CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A1A2C2	0180-0374		CAPACITOR-FXD 10UF+-10% 20VDC TA	0420J	150D106X9020B2
A1A2C3	0160-3670	10	CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C4	0160-4084	5	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A2C5	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A2C6	0160-2204	2	CAPACITOR-FXD 100PF +-5% 300VDC MICA 0+70	28480	0160-2204
A1A2C7	0160-2308	1	CAPACITOR-FXD 36PF +-5% 300VDC	28480	0160-2308
A1A2C8	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C9	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C10	0121-0474	1	CAPACITOR-V TRMR-PSTN .3-1.5PF 600V	28480	0121-0474
A1A2C11	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C12	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C13	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C14	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A2C15	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A2C16	0180-0269	1	CAPACITOR-FXD 1UF+75-10% 150VDC AL	0420J	30D105G150BA2
A1A2C17	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A2C18	0160-2204		CAPACITOR-FXD 100PF +-5% 300VDC MICA 0+70	28480	0160-2204
A1A2C19	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C20	0160-2238	1	CAPACITOR-FXD 1.5PF +-.25PF 500VDC	28480	0160-2238
A1A2C21	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C22	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2C23	0160-3670		CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A2CR1	1901-0535	1	DIODE-SCHOTTKY	28480	1901-0535
A1A2CR2	1901-0096	2	DIODE-SWITCHING 120V 50MA 100NS	28480	1901-0096
A1A2CR3	1901-0028	4	DIODE-PWR RECT 400V 750MA DO-29	0271C	MR493
A1A2CR4	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	0271C	MR493
A1A2CR5	1901-0096		DIODE-SWITCHING 120V 50MA 100NS	28480	1901-0096
A1A2CR6	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-[illegible]
A1A2CR7	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A2L1	9140-0210	3	COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A1A2L2	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A1A2L3	9140-0210		COIL-MLD 100UH 5% Q=50 .155DX.375LG	02178	15-1315-12J
A1A2Q1	1853-0232	2	TRANSISTOR PNP SI TO-39 PD=1W FT=200MHZ	28480	1853-0232
A1A2Q2	1854-0419	2	TRANSISTOR NPN SI TO-39 PD=1W FT=200MHZ	28480	1854-0419
A1A2Q3	1853-0232		TRANSISTOR PNP SI TO-39 PD=1W FT=200MHZ	28480	1853-0232
A1A2Q4	1853-0007	4	TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02038	2N3251
A1A2Q5	1854-0404	8	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2Q6	1854-0419		TRANSISTOR NPN SI TO-39 PD=1W FT=200MHZ	28480	1854-0419
A1A2Q7	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2Q8	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2Q9	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02038	2N3251
A1A2Q10	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02038	2N3251
A1A2Q11	1853-0007		TRANSISTOR PNP 2N3251 SI TO-18 PD=360MW	02038	2N3251
A1A2Q12	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2Q13	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2Q14	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2Q15	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2Q16	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A2R1	0757-0394	8	RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A1A2R2	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A1A2R3	0757-0442	2	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A2R4	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A1A2R5	2100-3351	2	RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	73138	72-142-0
A1A2R6	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A1A2R7	0757-0800	2	RESISTOR 5.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5621-F
A1A2R8	0757-0416	1	RESISTOR 511 1% .125W F TC=0+-100	03298	C4-1/8-T0-511R-F
A1A2R9*	0698-3154	1	RESISTOR 4.22K 1% .125W F TC=0+-100 *FACTORY SELECTED PART	03298	C4-1/8-T0-4221-F
A1A2R10	0757-0441	1	RESISTOR 8.25K 1% .125W F TC=0+-100	03298	C4-1/8-T0-8251-F
A1A2R11	0698-0085	1	RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A1A2R12	0757-0443	2	RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1102-F
A1A2R13	0757-0280	5	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A1A2R14	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A1A2R15	0757-0346	1	RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A1A2R16	0698-0084	3	RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A1A2R17	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A1A2R18	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A1A2R19	0757-0421	2	RESISTOR 825 1% .125W F TC=0+-100	03298	C4-1/8-T0-825R-F

Table 9-24. A1A2 Z Axis Amplifier, Replaceable Parts (2 of 2)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A2R20	0757-0428	1	RESISTOR 1.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1621-F
A1A2R21	0757-0443		RESISTOR 11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1102-F
A1A2R22	2100-3207	1	RESISTOR-TRMR 5K 10% C SIDE-ADJ 1-TRN	73138	72-145-0
A1A2R23	0698-3152	2	RESISTOR 3.48K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3481-F
A1A2R24	0698-3416	2	RESISTOR 21.5K 1% .5W F TC=0+-100	0532D	CMF-65-2
A1A2R25	0757-0841	2	RESISTOR 12.1K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-1212-F
A1A2R26	0698-3151	2	RESISTOR 2.87K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2871-F
A1A2R27	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A1A2R28	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A1A2R29	0757-0819	2	RESISTOR 909 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-909R-F
A1A2R30	2100-3351		RESISTOR-TRMR 500 10% C SIDE-ADJ 1-TRN	73138	72-142-0
A1A2R31	2100-3353	1	RESISTOR-TRMR 20K 10% C SIDE-ADJ 1-TRN	0374D	3386X-Y46-203
A1A2R32	2100-3355	1	RESISTOR-TRMR 100K 10% C SIDE-ADJ 1-TRN	73138	72-150-0
A1A2R33	0698-3158	1	RESISTOR 23.7K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2372-F
A1A2R34	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A1A2R35	2100-3354	2	RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	73138	72-149-0
A1A2R36	2100-3354		RESISTOR-TRMR 50K 10% C SIDE-ADJ 1-TRN	73138	72-149-0
A1A2R37	0698-0084		RESISTOR 2.15K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2151-F
A1A2R38	0698-3440	2	RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A1A2R39	0757-0274	1	RESISTOR 1.21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A1A2R40	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A1A2R41	0757-0200		RESISTOR 5.62K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5621-F
A1A2R42	0757-0421		RESISTOR 825 1% .125W F TC=0+-100	03298	C4-1/8-T0-825R-F
A1A2R43	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A2R44	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A1A2R45	0698-3152		RESISTOR 3.48K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3481-F
A1A2R46	0698-3416		RESISTOR 21.5K 1% .5W F TC=0+-100	0532D	CMF-65-2
A1A2R47	0757-0841		RESISTOR 12.1K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-1212-F
A1A2R48	0698-3151		RESISTOR 2.87K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2871-F
A1A2R49	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A1A2R50	0757-0394		RESISTOR 51.1 1% .125W F TC=0+-100	03298	C4-1/8-T0-51R1-F
A1A2R51	0757-0819		RESISTOR 909 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-909R-F
A1A2TP1	0360-0535	2	TERMINAL, TEST POINT	28480	0360-0535
A1A2TP2	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A1A2VR1	1902-3333	1	DIODE-ZNR 46.4V 5% DO-7 PD=.4W TC=+.081%	02038	BZ 10939-374
A1A2VR2	1902-3357	1	DIODE-ZNR 56.2V 5% DO-7 PD=.4W TC=+.081%	02038	BZ 10939-398
A1A2VR3	1902-0049	1	DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	02238	FZ7240
			A1A2 MISCELLANEOUS PARTS		
	5000-9043	1	PIN:P.C. BOARD EXTRACTOR	28480	5000-9043
	5040-6843	1	EXTRACTOR, P.C. BOARD	28480	5040-6843

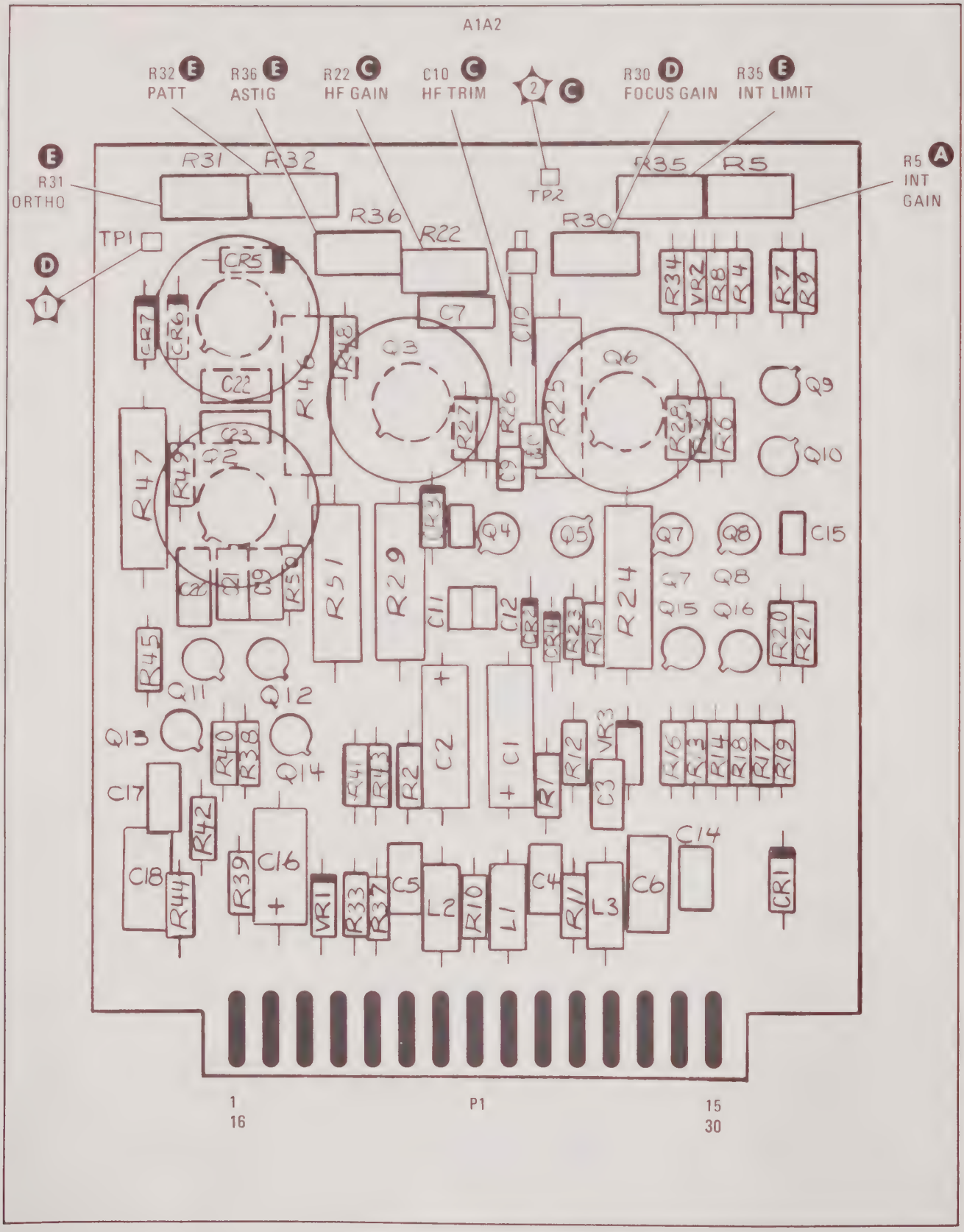


Figure 9-115. A1A2 Z Axis Amplifier, Component Locations

A1A3 HIGH VOLTAGE REGULATOR, CIRCUIT DESCRIPTION (Service Sheet 26)

WARNING

The CRT filament potential is connected to the −4000 Vdc cathode potential, which is dangerous to life.

The post-accelerator potential of approximately +18 kV is supplied by High Voltage Multiplier A1A11 (refer to block diagram).

High-Voltage Transformer (A)
High-Voltage Rectifier and Filter (B)

The cathode of CRT A1V1 operates at −4000 Vdc. This voltage is generated by rectifying an ac signal (approximately 30 kHz) on the secondary of High-Voltage Transformer T1. The primary side of T1 is an oscillator circuit located in A1A6 ±15V Regulator. The rectifier circuit consists of CR1 and filter components C1, R3, and C3. The CRT filament voltage of 4.45 Vrms is generated by another secondary winding of T1 and is held at −4000 Vdc by R1.

The cathode voltage is stabilized by a feedback control circuit consisting of R4, C4, and the amplifier circuit in A1A6 ±15V Regulator in conjunction with a primary feedback winding on T1. (Refer to the circuit description of A1A6.) The cathode voltage is set by HV ADJ potentiometer A1A6R32 in the Oscillator Level Control circuit of A1A6.

Control Grid Level Shift (C)

The control grid voltage is provided by generating a bias voltage with respect to the cathode voltage. This bias voltage is generated by a capacitively coupled, clipped sine-wave signal at the junction of C2 and C5. The sine wave is derived from the T1 secondary through R2. The upper clipping level is set by INTENSITY LIMIT adjustment A1A2R35 in A1A2 Z Axis Amplifier. The lower clipping level is set by the output of the Control Gate Amplifier in A1A2. The clipped sine-wave signal is coupled to the control grid circuit through C5, where it is rectified by CR3 and CR4 to generate a dc bias voltage across R7. C6, R10, and C7 are a filter to remove ripple from the bias voltage. C7 also allows fast pulse signals to be coupled directly to the the control grid, to maintain response times of 30 nsec or less.

Focus Grid Charge Level Shift (D)

The focus voltage is set by a resistive divider string from the cathode, with an intensity-focus correction bias developed in a manner similar to that of the control grid bias voltage described above. FOCUS LIMIT potentiometer R14 sets the focus grid to approximately −2500 Vdc, and the focus bias is generated by a clipped sine wave at the junction of C9 and C10. This upper clipping level is set by VR2 (+82.2V), and the lower clipping level is set by the FOCUS GATE voltage form A1A2.

Table 9-25. A1A3 High Voltage Regulator, Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A3	85662-60059	1	BOARD ASSEMBLY, HIGH VOLTAGE REGULATOR	28480	85662-60059
A1A3C1	0160-4148		CAPACITOR-FXD .033UF +-20% 6KVDC	0420J	830P333060
A1A3C2	0160-2264		CAPACITOR-FXD 20PF +-5% 500VDC CER0+-30	28480	0160-2264
A1A3C3	0160-4148		CAPACITOR-FXD .033UF +-20% 6KVDC	0420J	830P333060
A1A3C4	0160-3960		CAPACITOR-FXD 1000PF +-20% 8KVDC	28480	0160-3960
A1A3C5	0160-3960		CAPACITOR-FXD 1000PF +-20% 8KVDC	28480	0160-3960
A1A3C6	0160-0678		CAPACITOR-FXD .01UF +-20% 6KVDC	28480	0160-0678
A1A3C7	0160-0678		CAPACITOR-FXD .01UF +-20% 6KVDC	28480	0160-0678
A1A3C8	0160-0543		CAPACITOR-FXD 4700PF +-20% 4KVDC	28480	0160-0543
A1A3C9	0160-2264		CAPACITOR-FXD 20PF +-5% 500VDC CER0+-30	28480	0160-2264
A1A3C10	0160-0543		CAPACITOR-FXD 4700PF +-20% 4KVDC	28480	0160-0543
A1A3C11	0160-0543		CAPACITOR-FXD 4700PF +-20% 4KVDC	28480	0160-0543
A1A3C12	0160-3456		CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A1A3C13	0160-0543		CAPACITOR-FXD 4700PF +-20% 4KVDC	28480	0160-0543
A1A3C14	0180-0269		CAPACITOR-FXD 1UF+75-10% 150VDC AL	0420J	30D105G150BA2
A1A3CR1	1901-0683	1	DIODE-HV RECT 10KV 5MA 250NS	28480	1901-0683
A1A3CR2	1901-0028	8	DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3CR3	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3CR4	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3CR5	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3CR6	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3CR7	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3CR8	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3CR9	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A3R1	0686-1041	1	RESISTOR 100K 10% .25W FC TC=-400/+800	28480	0686-1041
A1A3R2	0687-3941	2	RESISTOR 390K 10% .5W CC TC=0+882	28480	0687-3941
A1A3R3	0687-4721	1	RESISTOR 4.7K 10% .5W CC TC=0+647	28480	0687-4721
A1A3R4	0698-8018	1	RESISTOR 30M 1% 3W CF TC=0+-100	03888	PVC175-3-T0-3004-F
A1A3R5	0684-1021	6	RESISTOR 1K 10% .25W FC TC=-400/+600	28480	0684-1021
A1A3R6	0684-1021		RESISTOR 1K 10% .25W FC TC=-400/+600	28480	0684-1021
A1A3R7	0686-1065	2	RESISTOR 10M 5% .5W CC TC=0+1059	28480	0686-1065
A1A3R8	0684-1021		RESISTOR 1K 10% .25W FC TC=-400/+600	28480	0684-1021
A1A3R9	0684-1021		RESISTOR 1K 10% .25W FC TC=-400/+600	28480	0684-1021
A1A3R10	0684-1051	2	RESISTOR 1M 10% .25W FC TC=-800/+900	28480	0684-1051
A1A3R11	0687-2221	1	RESISTOR 2.2K 10% .5W CC TC=0+647	28480	0687-2221
A1A3R12	0687-1001	1	RESISTOR 10 10% .5W CC TC=0+412	28480	0687-1001
A1A3R13	0698-8992	1	RESISTOR 8M 2% 1W C TC=0+-250	28480	0698-8992
A1A3R14	2100-3626	1	RESISTOR-TRMR 2M 20% C SIDE-ADJ 1-TRN	01686	63X2057C23
A1A3R15	0698-8993	1	RESISTOR 14M 2% 1W C TC=0+-250	28480	0698-8993
A1A3R16	0684-1011	1	RESISTOR 100 10% .25W FC TC=-400/+500	28480	0684-1011
A1A3R17	0687-3941		RESISTOR 390K 10% .5W CC TC=0+882	28480	0687-3941
A1A3R18	0684-1031	1	RESISTOR 10K 10% .25W FC TC=-400/+700	28480	0684-1031
A1A3R19	0686-1065		RESISTOR 10M 5% .5W CC TC=0+1059	28480	0686-1065
A1A3R20	0684-1021		RESISTOR 1K 10% .25W FC TC=-400/+600	28480	0684-1021
A1A3R21	0684-1021		RESISTOR 1K 10% .25W FC TC=-400/+600	28480	0684-1021
A1A3R22	0684-1051		RESISTOR 1M 10% .25W FC TC=-800/+900	28480	0684-1051
A1A3R23	0687-2231	1	RESISTOR 22K 10% .5W CC TC=0+765	28480	0684-2231
A1A3R24	0687-6801	1	RESISTOR 68 10% .5W CC TC=0+412	28480	0687-6801
A1A3T1	01332-01103	1	TRANSFORMER ASSEMBLY, HIGH VOLTAGE	28480	01332-01103
A1A3TP1			NOT ASSIGNED		
A1A3TP2			NOT ASSIGNE		
A1A3TP3			NOT ASSIGNED		
A1A3TP4	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A1A3TP5	0360-0535		TERMINAL, TEST POINT	28480	0360-0535
A1A3V1	2140-0018	2	LAMP-GLOW A9A-C 90/58VDC 700UA T-2-BULB	74276	A9A-C
A1A3V2	2140-0018		LAMP-GLOW A9A-C 90/58VDC 700UA T-2-BULB	74276	A9A-C
A1A3VR1	1902-0182	1	DIODE-ZNR 20.5V 5% DO-7 PD=.4W TC=+.072%	02233	FZ7290
A1A3VR2	1902-0197	1	DIODE-ZNR 82.5V 5% DO-15 PD=1W TC=+.082%	28480	1902-0197

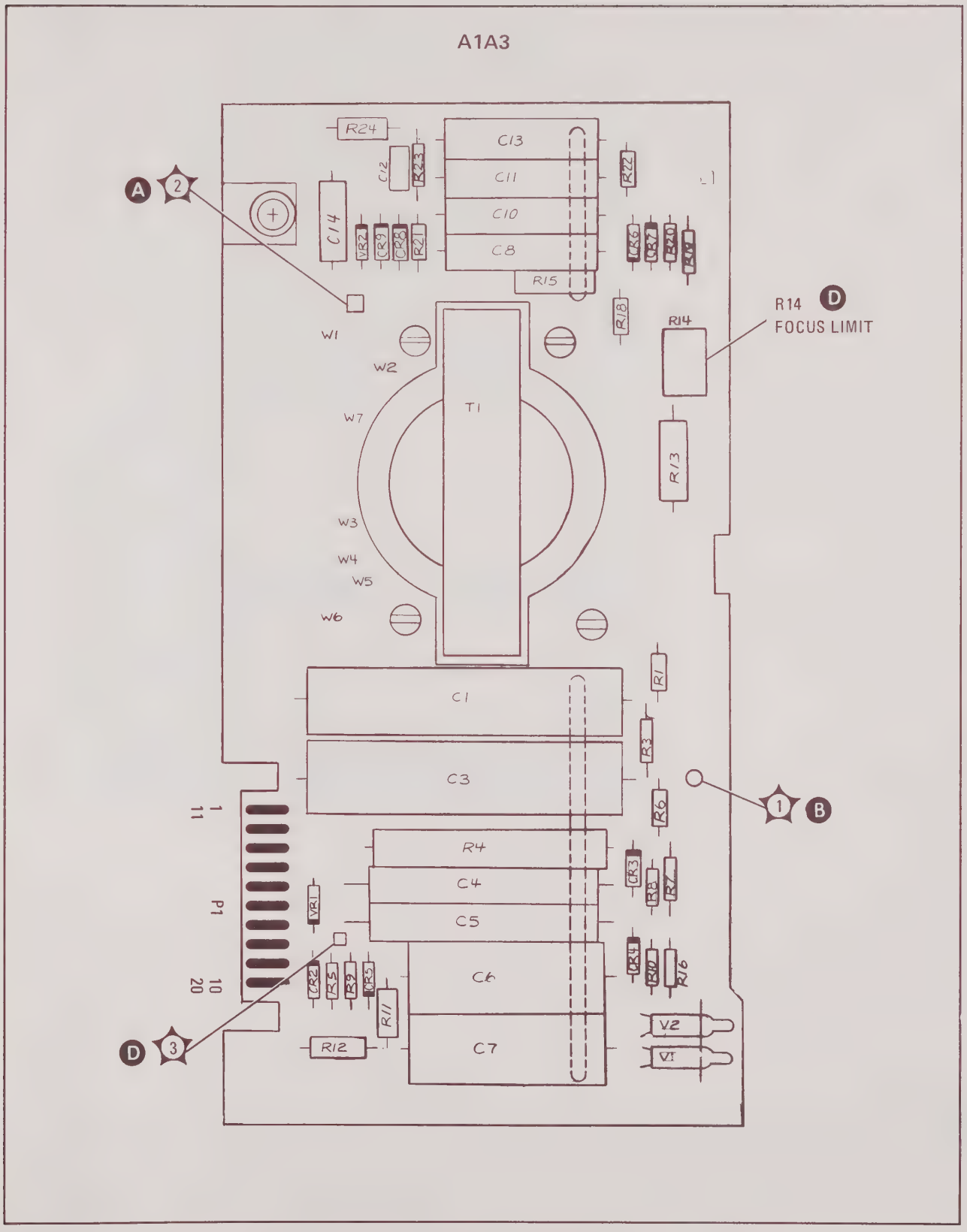


Figure 9-118. A1A3 High Voltage Regulator, Component Locations

A1A8 RECTIFIER, CIRCUIT DESCRIPTION (Service Sheet 27)

WARNING

Because of the high voltages found in this assembly, servicing should be accomplished only by qualified personnel.

A1A8 Rectifier contains three bridge rectifiers and one full-wave rectifier to provide unregulated power for the IF-Display Section. External power is supplied to the instrument through Line Module A1A12 and Power Transformer A1T1.

+9V UNREG

Full-wave rectifier CR7 and CR8 provides an unregulated +9V to A1A7 +200V, +5.2V Regulator. LED DS1 is lit whenever there is power to the transformer.

Test points TP1 and TP2, when jumpered together, cause HPON to go high, turning on the IF-Display Section in the absence of a signal from the RF Section when power is required for troubleshooting.

The LINE TRIGGER voltage is selected as required by A3A1 Trigger.

+118V UNREG

Bridge rectifier U1 provides an unregulated +118V to A1A7.

WARNING

The time constant of the filter capacitor circuit C2 and R6 is about 25 seconds. Before servicing, allow adequate time for discharge after line power is removed.

+23V UNREG

The +23V unregulated supply, bridge rectifier CR9 through CR12, includes an overvoltage protection circuit. If line power from a 220V/240V source is applied when the Line Voltage Selector is set to 100V/120V, the overvoltage causes CR6 to conduct, turning on CR5 to blow the fuse in the Line Module.

+5V UNREG

Bridge rectifier CR1 through CR4 provides unregulated +5 and −15V to A1A6 ±15V Regulator.

A1A9 BUS TRANSITION , CIRCUIT DESCRIPTION
(Service Sheet 27)

A1A9 Bus Transistion provides jack J2 (inside front panel) for the 50-wire Instrument Bus, which is routed through the IF-Display Section through a flat ribbon cable W8.

HPON, the IF-Display Section power on control line (W8 wire 22) is sensed by amplifier Q1 and Q2 to activate fan relay K1, which supplies line power to the cooling fan B1.

The +5.2V supply is connected to the LSTP line (W8 wire 43) through CR1 to halt operation of A15 Processor if there is a supply failure.

Table 9-26. A1A8 Rectifier, Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A8	85662-60051	1	BOARD ASSEMBLY, RECTIFIER	28480	85662-60051
A1A8C1	0160-2055	2	CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A1A8C2	0160-4298	1	CAPACITOR-FXD 4700PF +-20% 250VDC CER	0420J	C067F251H472M822-CDH
A1A8C3	0160-2055		CAPACITOR-FXD .01UF +80-20% 100VDC CER	28480	0160-2055
A1A8C4	0160-0168	2	CAPACITOR-FXD .1UF +-10% 200VDC POLYE	0420J	292P10492
A1A8C5	0160-0168		CAPACITOR-FXD .1UF +-10% 200VDC POLYE	0420J	292P10492
A1A8C6	0160-0970	1	CAPACITOR-FXD .47UF +-10% 400VDC POLYE	28480	0160-0970
A1A8C7	0180-0197	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A1A8CR1	1901-0662	10	DIODE-PWR RECT 100V 6A	0203G	MR751
A1A8CR2	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A1A8CR3	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A1A8CR4	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A1A8CR5	1884-0018	1	THYRISTOR-SCR 2N4186 VRRM=200	0203G	2N4186
A1A8CR6	1902-0656	1	DIODE-ZNR 39.2V 5% DO-15 PD=1W TC=+.081%	28480	1902-0656
A1A8CR7	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A1A8CR8	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A1A8CR9	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A1A8CR10	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A1A8CR11	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A1A8CR12	1901-0662		DIODE-PWR RECT 100V 6A	0203G	MR751
A1A8D81	1990-0486	1	LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0486
A1A8R1	0757-0420	1	RESISTOR 750 1% .125W F TC=0+-100	03298	C4-1/8-T0-751-F
A1A8R2	0757-0442	1	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A8R3	0698-0085	1	RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A1A8R4	0698-3152	1	RESISTOR 3.48K 1% .125W F TC=0+-100	03298	C4-1/8-T0-3481-F
A1A8R5	0757-0280	1	RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A1A8R6	0757-0367	1	RESISTOR 100K 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-1003-F
A1A8R7	0698-3407	1	RESISTOR 1.96K 1% .5W F TC=0+-100	0552D	CMF-65-2
A1A8R8	0698-3447	1	RESISTOR 422 1% .125W F TC=0+-100	03298	C4-1/8-T0-422R-F
A1A8TP1	0360-1788	2	CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SG	28480	0360-1788
A1A8TP2	0360-1788		CONNECTOR-SGL CONT PIN .045-IN-BSC-SZ SG	28480	0360-1788
A1A8U1	1901-0367	1	DIODE-FW BRDG 600V 1A	0203G	SDA-10185-7

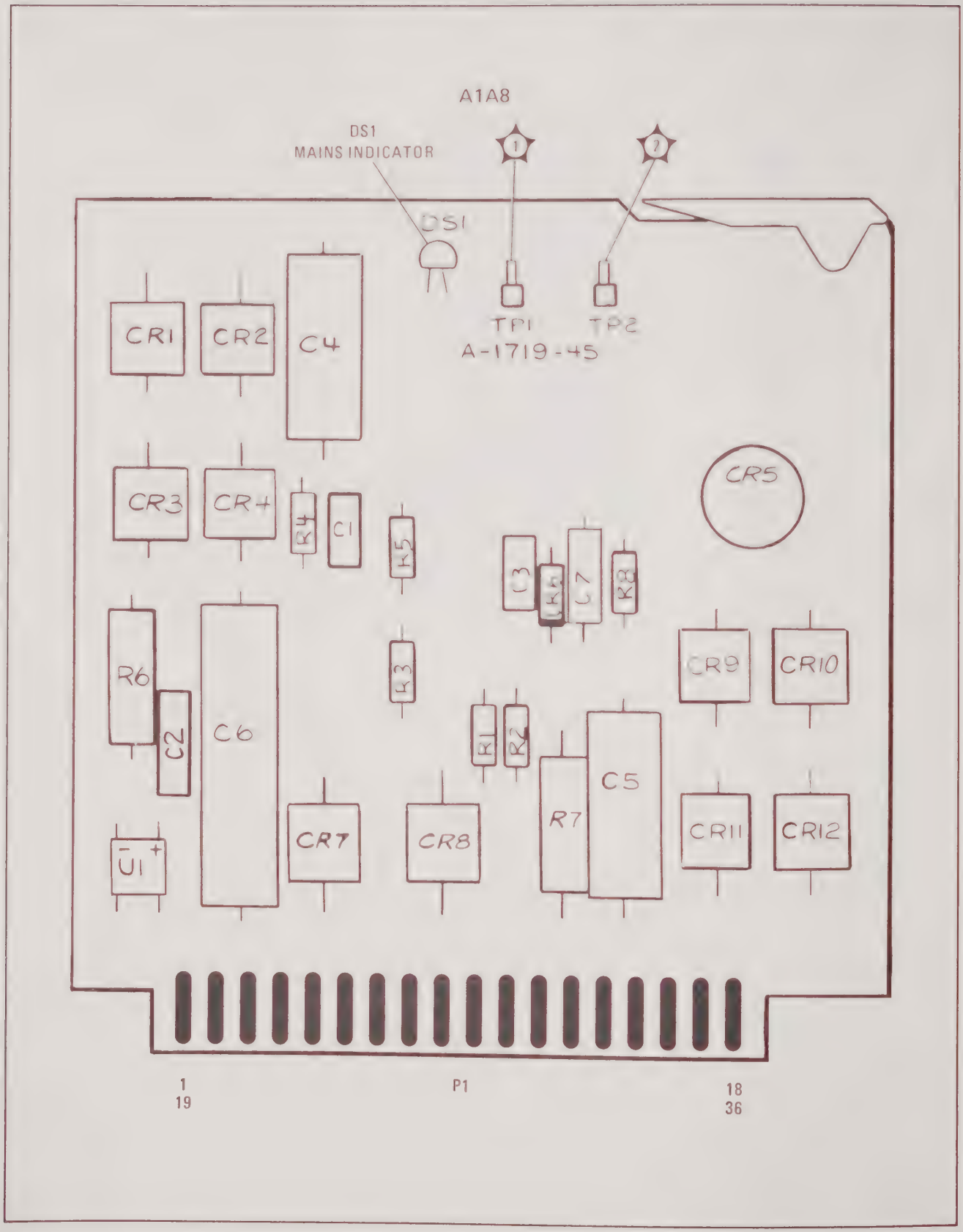


Figure 9-121. A1A8 Rectifier, Component Locations

Table 9-27. A1A9 Bus Transition, Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A9	85662-60056	1	BOARD ASSEMBLY, BUS TRANSITION(INCL W5)	28480	85662-60056
A1A9CR1	1901-0033	2	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A9CR2	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A9J1	1251-4828	1	CONNECTOR 50-PIN M POST TYPE	0138J	2-87230-5
A1A9J2	1251-4432	1	CONNECTOR 50-PIN F D SUBMIN	28480	1251-4432
A1A9K1	0490-0618	1	RELAY 2C 24VDC-COIL 5A 115VAC	28480	0490-0618
A1A9Q1	1854-0477	2	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	0223G	2N2222A
A1A9Q2	1854-0477		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	0223G	2N2222A
A1A9R1	0698-3157	1	RESISTOR 19.6K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1962-F
A1A9R2	0757-0442	2	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A9R3	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F

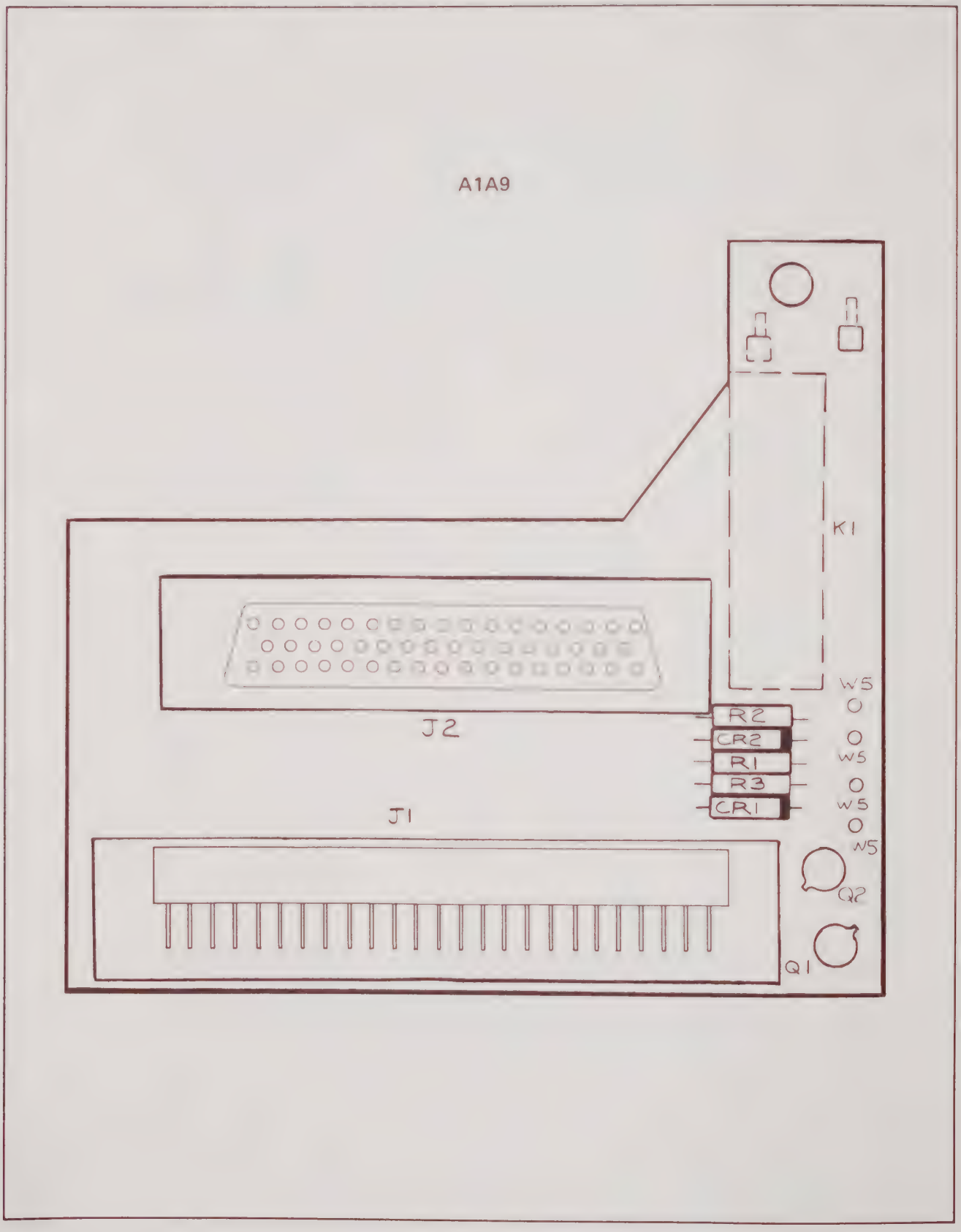


Figure 9-122. A1A9 Bus Transition, Component Locations

A1A6 ± 15V REGULATOR, CIRCUIT DESCRIPTION (Service Sheet 28)

WARNING

Unregulated voltages as high as +150V are present in the IF-Display Section whenever the power cord is connected to a power source. This condition is annunciated by LED indicator A1A8DS1. Remove the power cord when setting up service procedures.

The IF-Display section is activated by the logic signal HPON (power on), which is connected to the RF Section via wire number 22 of the Instrument Bus. A logic "0" (< +0.8V) holds the instrument in a standby condition with all unregulated supplies active and the regulated supplies turned off. A logic "1" (> +2.0V) turns on the regulators and activates the instrument.

A1A6 ±15V Regulator contains the +15V Regulator, to which all other supplies are referenced, the −15V Regulator, a thermal shutdown circuit, and active components necessary for A1A3 High Voltage Regulator to activate the CRT.

NOTE

Reference is made in the following paragraphs to components in other assemblies: A1A3 High Voltage Regulator and A1A7 +100V, +5.2V Regulator. These components are identified by complete reference designations; for example, A1A6Q7.

+15V Regulator (A)

Q1 and Q2 form a current source from the unregulated (+23V typical) supply. Under active conditions, this current drives Darlington regulator Q5 on until amplifier U1 senses an equal-voltage condition between voltage reference CR1 (U1 pin 3) and the sense input (U1 pin 4). U1 then holds that regulated condition by shunting the drive current through R4.

Foldback current limiting is provided by Q4 and the voltage divider string on its base. This circuit senses an overcurrent condition (higher voltage across R11, R18) and limits the current to a value proportional to the supply voltage.

Overvoltage crowbar circuit CR4 and associated circuitry shorts the output when an overvoltage condition of approximately +18.5V is reached. Zener diode CR3 conducts, turning on CR4, which conducts and blows fuse F1.

The regulator circuit can be shut down by turning on Q3, which shunts the source current to ground.

—15V Regulator B

The —15V Regulator is a tracking supply, holding the —15V supply to the same magnitude (inverted polarity) as the +15V supply, through divider resistors R19 and R20. Overvoltage and current limiting circuits are identical to those of the +15V supply.

Thermal Shutdown C

Thermistor R46 (negative temperature coefficient) is mounted to the heat sink of Q5 and Q9. As the heat sink temperature increases to approximately 85°C, the resistance decreases to less than 107Ω, and the voltage across the bridge circuit in which the thermistor is located changes polarity, causing U4 to go high. This turns on transistors Q3 and A1A7Q2, to shut down all power supplies, and transistor A1A1Q2, to light the front-panel STANDBY indicator. Current feedback through CR6 holds the bridge circuit in an unbalanced condition until the temperature drops to about 55°C, when the increased thermistor resistance again switches the bridge polarity. Q10 turns off the supplies by unbalancing the bridge when its input (HPON) is less than about +2.0V.

High-Voltage Oscillator D

The collector of A1A6Q7 is connected to the primary winding of transformer A1A3T1, and a feedback winding is connected to the base of Q7. Positive feedback from the feedback winding causes the circuit to oscillate at a frequency (approximately 25 to 30 kHz) determined primarily by the inductance and capacitance of T1. Q7 operates as a Class C amplifier, supplying a large current (approximately 2A peak) over a conduction period of less than one-half cycle.

Oscillator Level Control E

Amplifier U3 regulates the dc level of the high-voltage CRT cathode voltage by controlling the base drive to Q7 through the feedack winding. The cathode voltage is sampled via current through A1A3R4, which is compared with a reference current through A1A6R31, R32, and R50 (referenced to the +100V supply) at the input to U3. The output of U3 then holds the base drive at the level necessary to maintain about —4000 Vdc at the cathode of A1V1. Amplifier open loop gain is set by R35, with R34, R36, and C14 limiting the control loop bandwidth to approximately 7 Hz.

C15 supplies surge current for Q7, and L2 controls the conduction time of Q7. CR15 and CR16 allow U3 to generate self-bias sufficient to maintain level control if the —15V supply should fail.

Q8 disables the CRT by removing the +100V reference for the regulator circuit. Q8 is controlled from A4A9 IF Control, which may be addressed via the Instrument Bus.

A1A7 +100V, +5.2V REGULATOR, CIRCUIT DESCRIPTION (Service Sheet 28)

A1A7 +100V, +5.2V Regulator receives +118V unregulated and +9V unregulated inputs from A1A8 Rectifier to provide regulated outputs of +100V and +5.2V.

+100V Regulator A

Q6 and associated circuitry form a current source of approximately 3 mA from the unregulated +118V supply. Under active conditions, this current drives Q8 on until amplifier U2 senses an equal voltage condition between the voltage reference (divider resistors R8 and R9 from the +15V supply) and the sense input (U2 pin 2). U2 then holds the regulated condition by shunting current through Q4.

The +100V regulator circuit is shut down by PWR DWN going high, turning on Q2, which shunts the source current to ground.

+5.2V Regulator B

The +5.2V Regulator is similar to the −15V Regulator in A1A6 ±15V Regulator. It is referenced to the +15V supply and has overvoltage and current limiting circuits similar to those in the −15V Regulator.

Table 9-28. A1A6 ±15V Regulator, Replaceable Parts (1 of 2)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A6	A5662-60053	1	BOARD ASSEMBLY, +/-15V REGULATOR	28480	A5662-60053
A1A6C1	0180-2205	1	CAPACITOR-FXD .33UF+-10% 35VDC TA	0420J	150D334X9035A2
A1A6C2	0180-0116	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	0420J	150D685X9035B2
A1A6C3	0160-2199	2	CAPACITOR-FXD 30PF +-5% 300VDC	28480	0160-2199
A1A6C4	0180-1746	3	CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A1A6C5	0180-0228	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	150D226X9015B2
A1A6C6	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A1A6C7	0180-0197	1	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A1A6C8	0160-3456	1	CAPACITOR-FXD 1000PF +-10% 1KVDC CER	28480	0160-3456
A1A6C9	0160-2199		CAPACITOR-FXD 30PF +-5% 300VDC	28480	0160-2199
A1A6C10	0180-1735	1	CAPACITOR-FXD .22UF+-10% 35VDC TA	0420J	150D224X9035A2
A1A6C11	0180-1746		CAPACITOR-FXD 15UF+-10% 20VDC TA	0420J	150D156X9020B2
A1A6C12	0180-0141	1	CAPACITOR-FXD 50UF+75-10% 50VDC AL	0420J	30D506G050DD2
A1A6C13	0160-0166	1	CAPACITOR-FXD .039UF +-10% 200VDC POLYE	0420J	292P39392
A1A6C14	0160-4084	3	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A6C15	0160-0166	1	CAPACITOR-FXD .068UF +-10% 200VDC POLYE	0420J	292P68392
A1A6C16	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A6C17	0160-4084		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A6CR1			NOT ASSIGNED		
A1A6CR2	1901-0033	5	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A6CR3	1902-3224	2	DIODE-ZNR 17.8V 5% DO-7 PD=.4W TC=+.087%	02235	FZ7284
A1A6CR4	1884-0018	2	THYRISTOR-SCR 2N4186 VRRM=200	02035	2N4186
A1A6CR5			NOT ASSIGNED		
A1A6CR6	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A6CR7	1902-3224		DIODE-ZNR 17.8V 5% DO-7 PD=.4W TC=+.087%	02235	FZ7284
A1A6CR8	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A6CR9	1884-0018		THYRISTOR-SCR 2N4186 VRRM=200	02035	2N4186
A1A6CR10	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A6CR11	1901-0200	1	DIODE-PWR RECT 100V 1.5A	02035	SR1846-9
A1A6CR12			NOT ASSIGNED		
A1A6CR13	1901-0028	2	DIODE-PWR RECT 400V 750MA DO-29		
A1A6CR14	1901-0028		DIODE-PWR RECT 400V 750MA DO-29	28480	1901-0028
A1A6CR15	1901-0040	2	DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1A6CR16	1901-0040		DIODE-SWITCHING 30V 50MA 2NS DO-35	28480	1901-0040
A1A6CR17	1902-0556	1	DIODE-ZNR 20V 5% DO-15 PD=1W TC=+.073%	28480	1902-0556
A1A6CR18	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A6D81	1990-0487	2	LED-VISIBLE LUM-INTNSITY IF=20MA-MAX	28480	1990-0487
A1A6D82	1990-0487		LED-VISIBLE LUM-INTNSITY IF=20MA-MAX	28480	1990-0487
A1A6F1	2110-0083	1	FUSE 2.5A 250V FAST-BLO 1.25X.25 UL IEC	0W70C	312002.5
A1A6F2	2110-0002	1	FUSE 2A 250V FAST-BLO 1.25X.25 UL IEC	0W70C	312002.
A1A6F3	2110-0007	1	FUSE 1A 250V SLO-BLO 1.25X.25 UL IEC	0W70C	313001
A1A6L1	9140-0171	1	COIL-MLD 40UH 10% Q=20 .296DX.968LG	28480	9140-0171
A1A6L2	9100-1641	1	COIL-MLD 240UH 5% Q=65 .155DX.375LG	02114	15.1315-21J
A1A6Q1	1853-0281	3	TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02035	2N2907A
A1A6Q2	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02035	2N2907A
A1A6Q3	1854-0477	2	TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	02235	2N2222A
A1A6Q4	1854-0019	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A1A6Q5	1854-0611	2	TRANSISTOR NPN 2N6055 SI DARL TO-3	02035	2N6055
A1A6Q6	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A1A6Q7	1854-0518	1	TRANSISTOR NPN 2N5877 SI TO-3 PD=150W	02035	2N5877
A1A6Q8	1854-0477		TRANSISTOR NPN 2N2222A SI TO-18 PD=500MW	02235	2N2222A
A1A6Q9	1854-0611		TRANSISTOR NPN 2N6055 SI DARL TO-3	02035	2N6055
A1A6Q10	1853-0281		TRANSISTOR PNP 2N2907A SI TO-18 PD=400MW	02035	2N2907A
A1A6R1	0757-0442	7	RESISTOR 10K 1% .125W F TC=0+-100	03295	C4-1/8-T0-1002-F
A1A6R2	0698-3440	2	RESISTOR 196 1% .125W F TC=0+-100	03295	C4-1/8-T0-196R-F
A1A6R3	0757-0394	1	RESISTOR 51.1 1% .125W F TC=0+-100	03295	C4-1/8-T0-51R1-F
A1A6R4	0698-3150	1	RESISTOR 2.37K 1% .125W F TC=0+-100	03295	C4-1/8-T0-2371-F
A1A6R5	0698-3442	1	RESISTOR 237 1% .125W F TC=0+-100	03295	C4-1/8-T0-237R-F
A1A6R6	0757-1094	2	RESISTOR 1.47K 1% .125W F TC=0+-100	03295	C4-1/8-T0-1471-F
A1A6R7	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03295	C4-1/8-T0-1002-F
A1A6R8	0698-3247	1	RESISTOR 4.53K .25% .125W F TC=0+-50	28480	0698-3247
A1A6R9	2100-3095	1	RESISTOR-TRMR 200 10% C SIDE-ADJ 17-TRN	73138	89PR200
A1A6R10	0698-6835	1	RESISTOR 3.16K .5% .125W F TC=0+-50	03295	NC4-1/8-T2-3161-D
A1A6R11	0811-1669	2	RESISTOR 1.8 5% 2W PW TC=0+-400	04713	BWN-2-1R8-J
A1A6R12	0757-0280	2	RESISTOR 1K 1% .125W F TC=0+-100	03295	C4-1/8-T0-1001-F
A1A6R13	0757-0424	1	RESISTOR 1.1K 1% .125W F TC=0+-100	03295	C4-1/8-T0-1101-F
A1A6R14	0683-0275	2	RESISTOR 2.7 5% .25W FC TC=-400/+500	28480	0683-0275
A1A6R15	0698-3444	2	RESISTOR 316 1% .125W F TC=0+-100	03295	C4-1/8-T0-316R-F

Table 9-28. A1A6 ±15V Regulator, Replaceable Parts (2 of 2)

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A6R16	0757-0346	2	RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A1A6R17	0757-0317	2	RESISTOR 1.33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A1A6R18	0811-1669		RESISTOR 1.8 5% 2W PW TC=0+-400	04678	BWW2-1R8-J
A1A6R19	0698-7794	2	RESISTOR 10K .25% .125W F TC=0+-100	0299E	MF4C1/8-T0-1002-C
A1A6R20	0698-7794		RESISTOR 10K .25% .125W F TC=0+-100	0299E	MF4C1/8-T0-1002-C
A1A6R21	0698-3444		RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A1A6R22	0757-0418	2	RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A1A6R23	0757-0346		RESISTOR 10 1% .125W F TC=0+-100	03298	C4-1/8-T0-10R0-F
A1A6R24	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A1A6R25	0757-0418		RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A1A6R26	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A6R27	0757-0317		RESISTOR 1.33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A1A6R28	0811-1661	1	RESISTOR .39 5% 2W PW TC=0+-800	04678	BWW2-39/100-J
A1A6R29	0683-0275		RESISTOR 2.7 5% .25W FC TC=-400/+500	28480	0683-0275
A1A6R30	0757-0280		RESISTOR 1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1001-F
A1A6R31	0698-3453	1	RESISTOR 196K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1963-F
A1A6R32	2100-3094	1	RESISTOR-TRMR 100K 10% C SIDE-ADJ 17-TRN	73138	89PR100K
A1A6R33	0757-0465	2	RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A1A6R34	0757-0465		RESISTOR 100K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1003-F
A1A6R35	0683-2265	1	RESISTOR 22M 5% .25W FC TC=-900/+1200	28480	0683-2265
A1A6R36	0698-3459	1	RESISTOR 383K 1% .125W F TC=0+-100	28480	0698-3459
A1A6R37	0757-0403	1	RESISTOR 121 1% .125W F TC=0+-100	03298	C4-1/8-T0-121R-F
A1A6R38	0698-3446	2	RESISTOR 383 1% .125W F TC=0+-100	03298	C4-1/8-T0-383R-F
A1A6R39	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A6R40	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A6R41	0698-3446		RESISTOR 383 1% .125W F TC=0+-100	03298	C4-1/8-T0-383R-F
A1A6R42	0757-0290	2	RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A1A6R43	0698-4405	1	RESISTOR 107 1% .125W F TC=0+-100	03298	C4-1/8-T0-107R-F
A1A6R44	0757-1094		RESISTOR 1.47K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1471-F
A1A6R45	0757-0290		RESISTOR 6.19K 1% .125W F TC=0+-100	0299E	MF4C1/8-T0-6191-F
A1A6R46	0837-0126	1	THERMISTOR DISC 1K-OHM TC=-4.4%/C-DEG	28480	0837-0126
A1A6R47			NOT ASSIGNED		
A1A6R48	0698-3154	1	RESISTOR 4.22K 1% .125W F TC=0+-100	03298	C4-1/8-T0-4221-F
A1A6R49	0757-0816	1	RESISTOR 681 1% .5W F TC=0+-100	0299E	MF7C1/2-T0-681R-F
A1A6R50	0757-0482	1	RESISTOR 511K 1% .125W F TC=0+-100	0552D	CMF-55-1
A1A6R51	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A6R52	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A6TP1	1251-0600	7	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A6TP2	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A6TP3	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A6TP4	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A6TP5	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A6TP6	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A6TP7	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A6U1	1820-0223	2	IC 301 OP AMP	0379D	LM301A
A1A6U2	1820-0223		IC 301 OP AMP	0379D	LM301A
A1A6U3	1826-0167	1	IC OP AMP	0192A	CA3094AT
A1A6U4	1826-0026	1	IC COMPARATOR	0340F	LM311H
A1A6VR1	1902-0686	1	DIODE-ZNR 1N825 6.2V 2% DO-7 PD=.4W	28480	1902-0686
A1A6VR2	1902-0554	1	DIODE-ZNR 10V 5% DO-15 PD=1W TC=+.06%	28480	1902-0554
			A1A6 MISCELLANEOUS PARTS		
	4040-0754	1	EXTRACTOR-PC BOARD BLU POLYC	28480	4040-0754

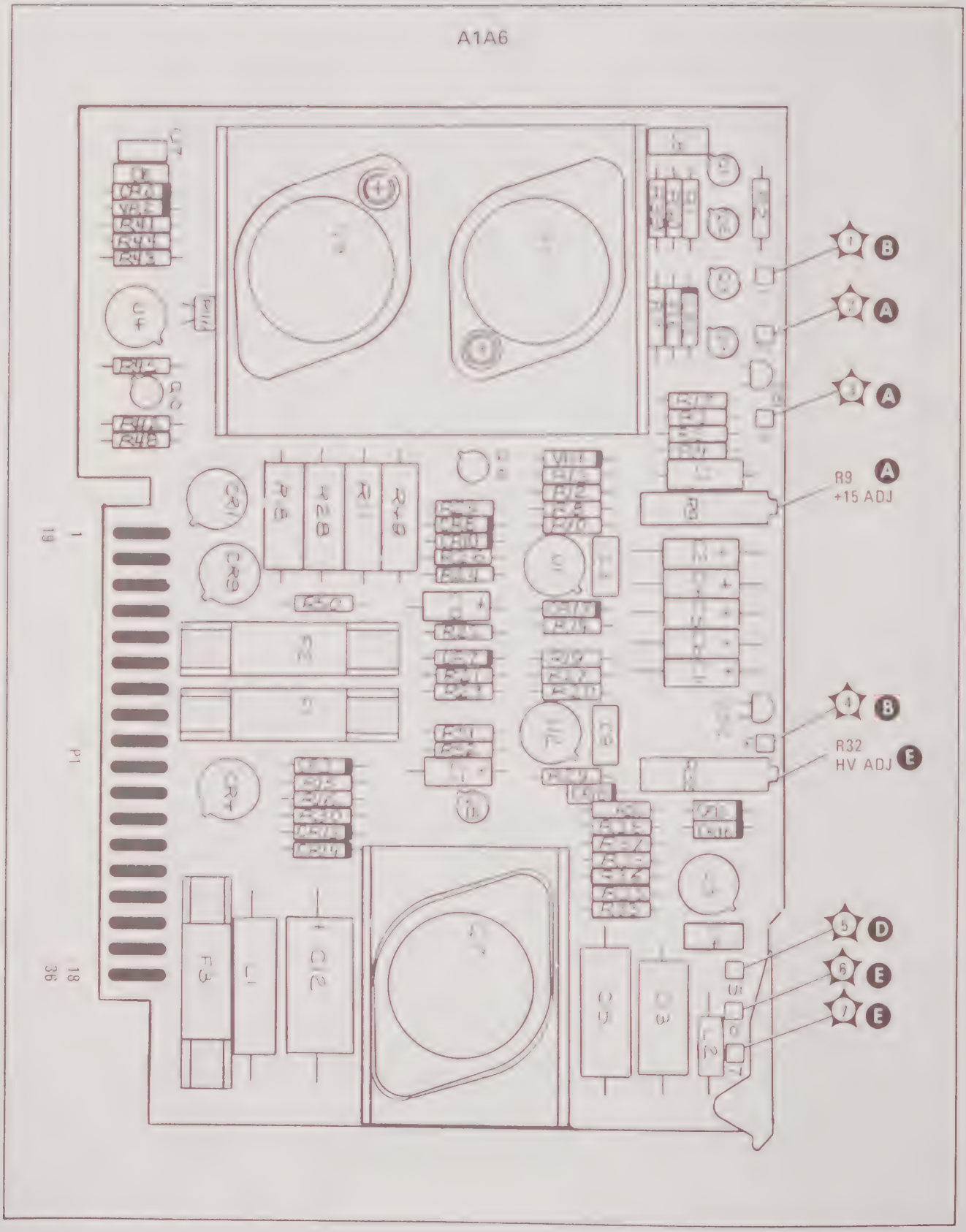


Figure 9-125. A1A6 ±15V Regulator, Component Locations

Table 9-29. A1A7 +100V, +5.2V Regulator, Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A7	85662-60052	1	BOARD ASSEMBLY, +100V+5.2V REGULATOR	28480	85662-60052
A1A7C1	0180-0197	2	CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A1A7C2	0160-3670	1	CAPACITOR-FXD .1UF +-20% 200VDC CER	28480	0160-3670
A1A7C3	0160-2199	2	CAPACITOR-FXD 30PF +-5% 300VDC	28480	0160-2199
A1A7C4	0180-0228	2	CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	150D226X9015B2
A1A7C5	0160-2199		CAPACITOR-FXD 30PF +-5% 300VDC	28480	0160-2199
A1A7C6	0180-0291	1	CAPACITOR-FXD 1UF+-10% 35VDC TA	0420J	150D105X9035A2
A1A7C7	0180-0228		CAPACITOR-FXD 22UF+-10% 15VDC TA	0420J	150D226X9015B2
A1A7C8	0180-0197		CAPACITOR-FXD 2.2UF+-10% 20VDC TA	0420J	150D225X9020A2
A1A7C9	0160-3449	1	CAPACITOR-FXD 2000PF +-10% 250VDC CER	28480	0160-3449
A1A7C10	0160-4084	1	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-4084
A1A7CR1	1901-0050	2	DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A1A7CR2	1901-0050		DIODE-SWITCHING 80V 200MA 2NS DO-7	28480	1901-0050
A1A7CR3	1901-0033	2	DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A7CR4	1902-0513	1	DIODE-ZNR 82.5V 2% DO-15 PD=1W TC=+.082%	28480	1902-0513
A1A7CR5	1902-3256	1	DIODE-ZNR 23.7V 5% DO-7 PD=.4W TC=+.076%	02233	FZ7296
A1A7CR6	1901-0033		DIODE-GEN PRP 180V 200MA DO-7	28480	1901-0033
A1A7CR7	1902-0049	1	DIODE-ZNR 6.19V 5% DO-7 PD=.4W TC=+.022%	02233	FZ7240
A1A7CR8	1884-0018	1	THYRISTOR-SCR 2N4186 VRRM=200	02033	2N4186
A1A7CR9	1901-0200	1	DIODE-PWR RECT 100V 1.5A	02033	SR1846-9
A1A7D81	1990-0487	2	LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0487
A1A7D82	1990-0487		LED-VISIBLE LUM-INT=1MCD IF=20MA-MAX	28480	1990-0487
A1A7F1	2110-0010	1	FUSE 5A 250V FAST-BLO 1.25X.25 UL IEC	04702	312005.
A1A7F2	2110-0004	1	FUSE .25A 250V FAST-BLO 1.25X.25 UL IEC	04702	312.250
A1A7L1	9100-1641	1	COIL-MLD 240UH 5% Q=65 .155DX.375LG	02113	15-1315-21J
A1A7Q1	1854-0404	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A7Q2	1854-0404		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0404
A1A7Q3	1854-0019	2	TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A1A7Q4	1854-0523	1	TRANSISTOR NPN SI TO-39 PD=1W FT=150MHZ	28480	1854-0523
A1A7Q5	1854-0019		TRANSISTOR NPN SI TO-18 PD=360MW	28480	1854-0019
A1A7Q6	1854-0618	1	TRANSISTOR NPN SI DARL TO-3 PD=150W	02033	MJ3000
A1A7Q7	1853-0414	1	TRANSISTOR PNP 2N6423 SI TO-66 PD=35W	28480	1853-0414
A1A7Q8	1854-0311	1	TRANSISTOR NPN 2N4240 SI TO-66 PD=35W	0192A	2N4240
A1A7R1	0757-0466	1	RESISTOR 110K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1103-F
A1A7R2	0757-0442	5	RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A7R3	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A7R4	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A7R5	0698-3440	2	RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A1A7R6	0698-3440		RESISTOR 196 1% .125W F TC=0+-100	03298	C4-1/8-T0-196R-F
A1A7R7	0757-0317	2	RESISTOR 1.33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A1A7R8	0757-0438	2	RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A1A7R9	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A7R10	0698-7794	1	RESISTOR 10K .25% .125W F TC=0+-100	0299E	MF4C1/8-T0-1002-C
A1A7R11	0698-8417	1	RESISTOR 5.3K .25% .125W F TC=0+-50	0299E	MF4C1/8-T2-5301-C
A1A7R12	0757-0418	2	RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A1A7R13	0757-0276	1	RESISTOR 61.9 1% .125W F TC=0+-100	03298	C4-1/8-T0-61R9-F
A1A7R14	0757-0438		RESISTOR 5.11K 1% .125W F TC=0+-100	03298	C4-1/8-T0-5111-F
A1A7R15	0757-0274	1	RESISTOR 1.21K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1213-F
A1A7R16	0698-3427	2	RESISTOR 13.3 1% .125W F TC=0+-100	03888	PME55-1/8-T0-13R3-F
A1A7R17	0757-0401	1	RESISTOR 100 1% .125W F TC=0+-100	03298	C4-1/8-T0-101-F
A1A7R18	0812-0066	2	RESISTOR .33 5% 2W PW TC=0+-800	04678	BWH2-33/100-J
A1A7R19	0698-3444	1	RESISTOR 316 1% .125W F TC=0+-100	03298	C4-1/8-T0-316R-F
A1A7R20	0683-0275	1	RESISTOR 2.7 5% .25W FC TC=-400/+500	28480	0683-0275
A1A7R21	0698-0085	1	RESISTOR 2.61K 1% .125W F TC=0+-100	03298	C4-1/8-T0-2611-F
A1A7R22	0698-3453	1	RESISTOR 196K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1963-F
A1A7R23	0757-0464	1	RESISTOR 90.9K 1% .125W F TC=0+-100	03298	C4-1/8-T0-9092-F
A1A7R24	0757-0442		RESISTOR 10K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1002-F
A1A7R25	0698-3427		RESISTOR 13.3 1% .125W F TC=0+-100	03888	PME55-1/8-T0-13R3-F
A1A7R26	0757-0444	1	RESISTOR 12.1K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1212-F
A1A7R27	0757-0418		RESISTOR 619 1% .125W F TC=0+-100	03298	C4-1/8-T0-619R-F
A1A7R28	0757-0317		RESISTOR 1.33K 1% .125W F TC=0+-100	03298	C4-1/8-T0-1331-F
A1A7R29	0812-0066		RESISTOR .33 5% 2W PW TC=0+-800	04678	BWH2-33/100-J
A1A7TP1	1251-0600	4	CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A7TP2	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A7TP3	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A7TP4	1251-0600		CONTACT-CONN U/W-POST-TYPE MALE DPSLDR	28480	1251-0600
A1A7U1	1820-0223	2	IC 301 OP AMP	0379D	LM301A
A1A7U2	1820-0223		IC 301 OP AMP	0379D	LM301A
			A1A7 MISCELLANEOUS PARTS		
	4040-0755		EXTRACTOR-PC BOARD VIO POLYC	28480	4040-0755
	1480-0073	1	PIN:DRIVE 0.250" LG	28480	1480-0073

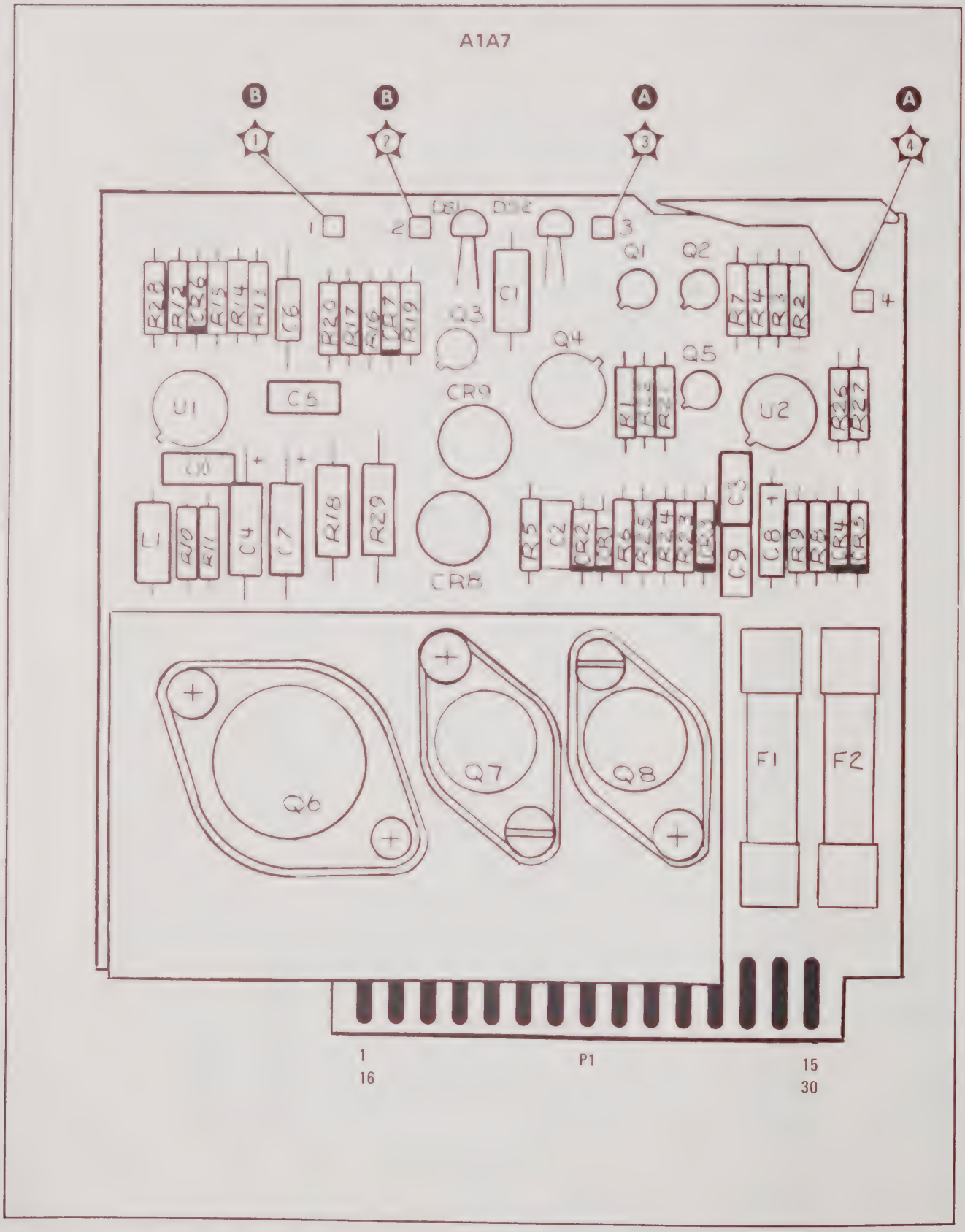


Figure 9-126. A1A7 +100V, +5.2V Regulator, Component Locations

Table 9-30. A1A10 Display Motherboard, Replaceable Parts

Reference Designation	HP Part Number	Qty	Description	Mfr Code	Mfr Part Number
A1A10	85662-60050	1	BOARD ASSEMBLY, DISPLAY MOTHER BOARD (INCLUDES W3)	28480	85662-60050
A1A10C1	0180-2808	1		28480	0180-2808
A1A10C2	0180-2642	1	CAPACITOR-FXD 250UF+50-10% 250VDC AL	0420J	36DX251F250AA2A
A1A10C3	0180-2641	1	CAPACITOR-FXD .018F+75-10% 40VDC AL	0420J	36DX183G040EC2A
A1A10C4	0180-0453	1	CAPACITOR-FXD 8700UF+75-10% 40VDC AL	28480	0180-0453
A1A10J1	1200-0508	2	SOCKET-IC 14-CONT DIP-SLDR	06776	0002812
A1A10J2	1200-0508		SOCKET-IC 14-CONT DIP-SLDR	06776	0002812
A1A10J3	1251-4798	1	CONNECTOR 6-PIN M POST TYPE	22526	65595-106
A1A10J4	1251-4804	3	CONNECTOR 4-PIN M POST TYPE	22526	65595-104
A1A10J5	1251-4804		CONNECTOR 4-PIN M POST TYPE	22526	65595-104
A1A10J6	1251-3195	1	CONNECTOR 4-PIN M POST TYPE	27264	09-60-1041(2403-04A)
A1A10J7	1251-4281	1	CONNECTOR 9-PIN M POST TYPE	27264	09-65-1091
A1A10J8	1251-4990	1		28480	1251-4990
A1A10J9	1251-4804		CONNECTOR 4-PIN M POST TYPE	22526	65595-104
A1xA2	1251-2035	4	CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	04500	252-15-30-300
A1xA3	1251-2034	1	CONNECTOR-PC EDGE 10-CONT/ROW 2-ROWS	04500	252-10-30-300
A1xA4	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	04500	252-15-30-300
A1xA5	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	04500	252-15-30-300
A1xA6	1251-2026	2	CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A1xA7	1251-2035		CONNECTOR-PC EDGE 15-CONT/ROW 2-ROWS	04500	252-15-30-300
A1xA8	1251-2026		CONNECTOR-PC EDGE 18-CONT/ROW 2-ROWS	04500	252-18-30-300
A1A11	0960-0383	1	MULTIPLIER, HV, 20KV	28480	0960-0383

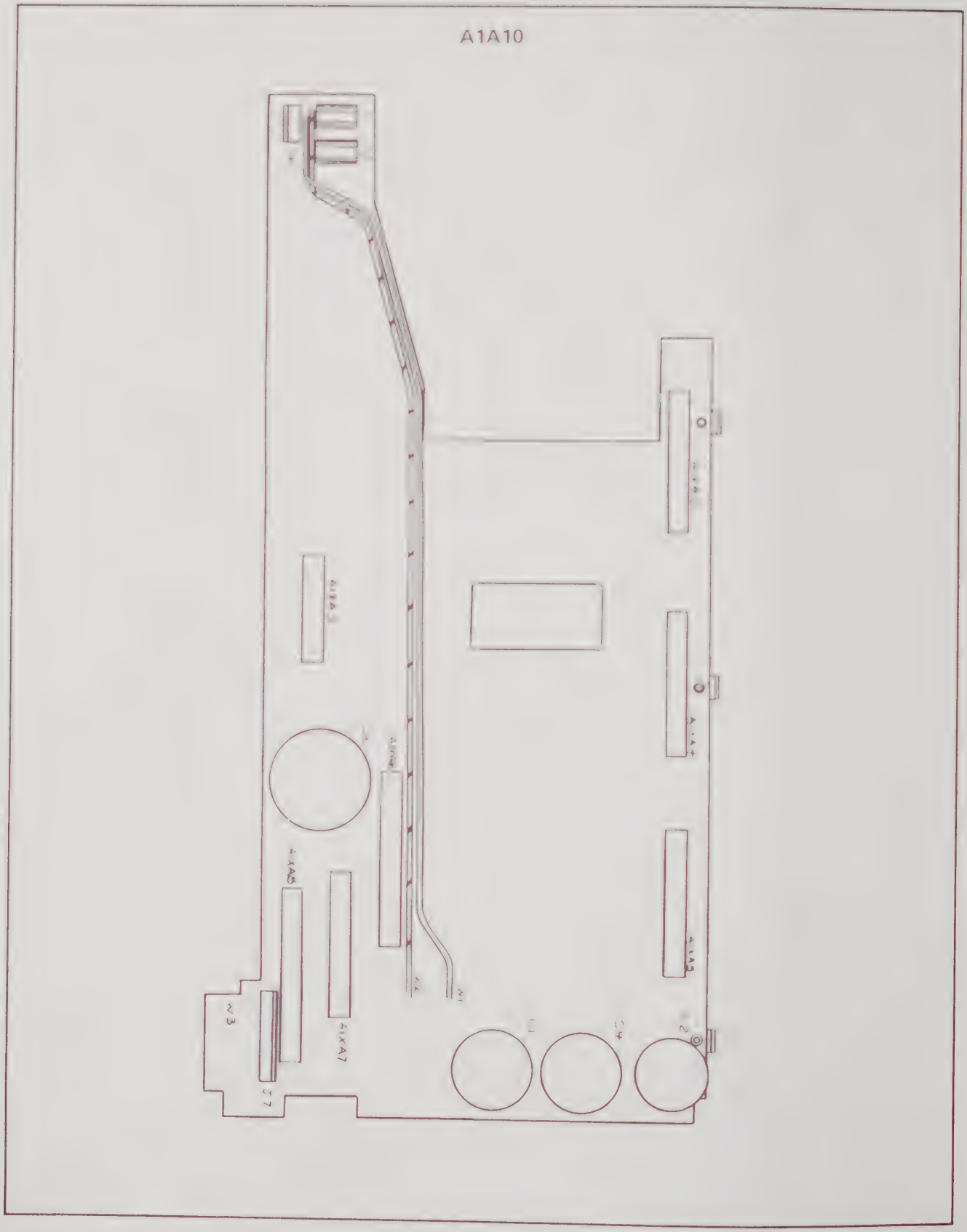


Figure 9-129. A1A10 Display Motherboard, Component Locations

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